DRAFT

STANDARD GEOSPATIAL SUPPORT DATA EXTENSIONS FOR THE NATIONAL IMAGERY TRANSMISSION FORMAT STANDARD

25 FEBRUARY 1997

FOREWORD

1. This document is approved for use by all deprtments and agencies of the Depart of Defense (DOD).

2. TBD

3. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed the National Imagery and Mapping Agency, Interoperability Branch (SEII), 14675 Lee Road, Chantilly, VA 20151-1715.

CONTENTS

1. SCOPE

1.1 Scope. This document specifies the format and content of a set of controlled tagged record extensions for the NITF. Detailed descriptions are provided for the overall structure, as well as specification of the valid data content and format, for all fields defined within each specified support data extension (SDE). In addition, technical information is presented to provide a general understanding of the significance of the included fields.

1.2 Purpose. TBD

1.3 Applicability. TBD

2. APPLICABLE DOCUMENTS

The applicable documents in section 2 MIL-STD-2500B apply to this document.

3. DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this document.

4. GENERAL REQUIREMENTS

4.1 Appropriate support data. That set of support data needed to accomplish the mission of a system receiving a NITF file is referred to as "appropriate" support data. The appropriate support data may vary across systems receiving NITF files. A system receiving a NITF file may add or subtract support data before passing the file to another system with a different mission. This strategy implies a modular support data definition approach.

4.2 NITF file containing georeferenced image, matrix, or raster map data. Image and raster map providers produce NITF files with support data from other formats which also contain support information. The extensions described herein define the format for that support information required within a NITF file containing geo-referenced image, matrix, or raster map data such as that defined in the DIGEST standard. The specified tagged records incorporate all SDEs relevant to geo-referenced image, matrix, or raster map data such as that defined in the Digital Geographic Information Exchange Standard (DIGEST). The information which makes up the SDE is derived from referenced standards including DIGEST. Systems using DIGEST imagery, matrix, or raster map data formatted according to NITF should be designed to extract the needed data from the tagged records described herein. The categories of image items in a NITF file, to which the standard support extensions apply, are shown in table I.

TABLE I. Categories of image/matrix/grid data.

Categories of Image/Matrix/Grid Data			Data extension to be included in the image subheader		
Definition	ICAT	IREP	ACCURACY	LOCATION	SOURCE
Raster Maps	MAP	MONO, RGB, RGB/LUT	ACCPO or ACCHZ & ACCVT	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SOURC
Definition	ICAT	IREP	ACCURACY	LOCATION	SOURCE
Geo-referenced Imagery	VIS, SL, TI , FL, RD, EO, OP, HR, HS, CP, BP, SAR, IR, MS	MONO, RGB, RGB/LUT, MULTI	ACCHZ	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SNSPS
Matrix Data (elevations)	DTEM	1D, ND	ACCPO or ACCHZ & ACCVT	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SOURC
Matrix Data (other)	MATR	1D, ND	ACCPO or ACCHZ & ACCVT	GEOPS + one of: GEOLO MAPLO GRDPS REGPT	SOURC

4.3 Georeferenced image, raster map, matrix, or grid data SDEs. The following SDEs are defined for use with geo-referenced image, raster map, matrix, or grid data:

a. For spatial location:

GEOPS	for geo-referencing parameters including datums, ellipsoids, and projections
GRDPS	for non-rectified image, raster, or matrix data that is positioned using a location grid
GEOLO	for image, raster, or matrix data rectified consistently with geographic (lat/long) coordinate systems
MAPLO	for image, raster, or matrix data rectified consistently with cartographic (E,N) coordinate systems
REGPT	for registration points in either geographic or cartographic systems

b. For positional accuracy:

ACCPO	for horizontal and vertical accuracy over regions for which the definitions are constant
ACCHZ	for horizontal accuracy when the vertical accuracy vary across the region for which horizontal accuracy are constant
ACCVT	for vertical accuracy when the horizontal accuracy vary across the region for which vertical accuracy are constant

Positional accuracy description is required when spatial location is defined.

c. For source description:

SNSPS for sensor parameters
SOURC for map source information

5. DETAILED REQUIREMENTS

5.1. Generic tagged extension mechanism. The tagged record extensions defined in this document are "controlled tagged record extensions" as defined in paragraph 26b of the NITF standard. The tagged record extension format is summarised here for ease of reference. Table II describes the general format of a controlled tagged record extension. The CETAG, CEVER, and CEL fields essentially form a small (11 byte) tagged record subheader. The format and meaning of the data within the CEDATA field is the subject of this document for several individual controlled tagged record extensions. Multiple tagged extensions can exist within the tagged record extension area. There are several such areas, each of which can contain 99,999 bytes worth of tagged extensions. There is also an overflow mechanism, should the sum of all tags in area exceed 99,999 bytes. The overflow mechanism allows for up to one gigabyte of tags. While the extensions defined in this document will typically be found in the image subheader (IXSHD field), it is possible that they could appear in a Data Extension Segment which is being used as an overflow of the image subheader.

5.2 Field types. If the information contained within an extension is not available, the extension will not be present in the file. For example, if positional accuracy is homogeneous across the whole data set extension, then the Horizontal and Vertical Accuracy Records will not appear since all of the accuracy will be contained in the Positional Accuracy Record. When an extension is present, all of the information listed as Required (type = R) must be filled in with valid information.

TABLE II. Controlled tagged record extension format
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Type Identifier. This field shall contain a valid alphanumeric identifier properly registered with the control authority (TBR).	6	(BCS-A)	R
CEL	Length of CEDATA Field (Number of Bytes). This field shall contain the length, in bytes, of the data contained in CEDATA. The tagged record's length is 11 + the value of CEL.	5	(BCS-N) 00001 to 99988	R
CEDATA	User-defined Data. This field shall contain data of either binary or character data types defined by and formatted according to user specification. The length of this field shall not cause any other NITF field length limits to be exceeded but is otherwise fully user defined.	Value of the CEL field*	User-defined	R

APPENDIX A

SPATIAL DATA EXTENSIONS

A.1 SCOPE

This appendix is intended to describe the standard support data extensions (SDEs) used to properly transfer geospatial information to provide accuracy, and coordinate data. The nature of raster data is inherently different than vector data because the pixel representations are rows and columns which means the surface of the earth is being mapped to some type of rectangular grid. Map makers have faced this challenge since the beginning of their profession and many solutions have been put forth to project the spheroidal geometry of the earth to a flat surface such as a paper map. Images of the earth's surface inherit additional complexities due to the look angle of cameras and the other imaging parameters such as focal length, atmosphere refraction, etc.

A.2 APPLICABLE DOCUMENTS

STANAG 7074/AGeoP-3A	-	Digital Geographic Information Exchange Standard (DIGEST), Edition 1.2a, June 1995.

A.3 DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this appendix.

A.4 GENERAL REQUIREMENTS

A.4.1 Approximate geographic location. The IGEOLO and ICOORDS field in the image subheader shall only be used for coarse representation of the geographic or cartographic coordinates of the image.

A.4.2 Accurate geographic location. The specified tagged records incorporate all SDEs relevant to geo-referenced image, matrix, or raster map data such as that defined in the Digital Geographic Information Exchange Standard (DIGEST). The information which makes up the SDE is derived from referenced standards including DIGEST. Systems using DIGEST and/or NIMA’s imagery, matrix or raster map data formatted according to NITF should be designed to extract the needed data from the tagged records described herein.

A.4.3 Coordinate systems.

A.4.3.1 General. Most people are familiar with the concept of latitude and longitude for locating places on the face of the earth. Most people have also used graph paper to lay out a garden or house plan where distance left-right and up-down are so many grids cells or simple (x-y) orthogonal measurements in inches or centimetres. These principles for coordinates apply in the geospatial sense but more detail is needed to insure data transfer carries the meaning intended by the transmitter to the receiver.

A.4.3.2. Coordinate system types. Three types of coordinate systems are defined for geospatial information: (1) Geographic (GEO), (2) Cartographic (MAP), and (3) Relative (DIG).

A.4.3.2.1 GEO. Geographic coordinates are expressed in latitude and longitude and are based on a geodetic datum, including both the geodetic ellipsoid and zero meridian. For the purposes of this standard, the zero meridian will default to GREENWICH (zero degrees longitude). Datums and ellipsoids are carried in the GEOPS extension. DIGEST lists more then 200 different datums. There are so many datums because geodesy continues to refine the understanding of the shape and gravity of the earth. As these refinements mature, maps and other spatial data tend to reflect the best knowledge available at the time the maps and/or data were produced. To properly interpret coordinates one must take into account the mathematics in effect at the time of production. It is often necessary to convert coordinates to a common coordinate system when using data produced in different time frames or by different organisations. Ellipsoids go along with many datums, but DIGEST lists fewer than 60 different ellipsoids. This is because many local datums exist without reference to an ellipsoid but all global coordinate systems use an ellipsoid. Modern mapping prefers the ellipsoid and datum to be consistent with the World Geodetic System 1984 (WGS84).

A.4.3.2.2 MAP. When using a cartographic coordinate system a location is specified as being so many units North/South (Northing) and so many units East/West (Easting) from a reference point within a defined projection plane. The projection is a mathematical relationship that defines a one-to-one mapping between the geodetic ellipsoid and the projection plane. A cartographic coordinate system is based on a projection (with values for all its associated parameters) applied to a geodetic datum (see above). The projection parameters are described in the GEOPS extension. DIGEST lists approximately 20 different projections and they require from one to four parameters. Note: The cartographic coordinate system may not be described using only PROJECTION field. The geographic coordinate system to which the defined projection applies must always be described.

A.4.3.2.3 DIG. A relative coordinate system is the natural occurrence when using a digitising tool, a scanner, or raw imagery. These relative coordinate systems must be registered to an absolute coordinate system in order to represent real locations. The absolute coordinate systems may be GEO or MAP as described above. The registration between the relative and absolute coordinate systems will be defined either by the description of registration points (generally three or more) or by the description of location grid(s) (at least one). Normally, the error introduced during digitizing is small compared to the error in the source graphic, but it should not be ignored.

A.4.3.3 Rectified image/raster local coordinate system. Rows and columns of a rectified image/raster data form a regular grid whose axes are parallel to the axes of the absolute coordinate system as defined in the GEOPS extension. When terrain relief is included in the rectification process, the result is called « ortho-rectified ». This will be more spatially correct, especially in area that have considerable elevation differences. In this local coordinate system, coordinate sets are composed of a row number and a column number (r,c). The order in which rows and columns are numbered is described in annex C paragraph 17. The GEOLO and MAPLO extensions provide the appropriate parameters for computing the spatial location of each pixel from its row and column number.

a. MAPLO must be used if the absolute coordinate system is a cartographic coordinate system (E, N). It defines the Easting and Northing of the origin of the grid (LSO,PSO) and the rows and columns width (LOD,LAD) using a defined linear unit (UNILOA).

$$E = LSO + c * LOD * (1_{UNI} / 1_{UNILOA})$$
$$N = PSO - r * LAD * (1_{UNI} / 1_{UNILOA})$$

NOTE: $(1_{UNI} / 1_{UNILOA})$ means the conversion of the unit of LOD (LAD) given by the field UNILOA into the unit of E (S) called UNI in these formulas. If the units are the same, this ratio is equal to 1.

b. GEOLO must be used if the absolute coordinate system is a geographic coordinate system (Long, Lat). It defines the longitude and latitude of the origin of the grid (LSO,PSO), and the number of rows and columns in 360° (ARV,BRV).

$$Long = LSO + c * (360°)_{UNI} / ARV$$
$$Lat = PSO - r * (360°)_{UNI} / BRV$$

NB : $(360°)_{UNI}$ means the value of a 360° angle expressed in the unit of Lat (Long). If the units are degrees, the value is 360.

A.4.3.4 GRID reference image. Non-rectified image or matrix data can be accurately geo-referenced with a grid reference image file. This is the GRDPS extension. Basically, this involves superimposing a grid of spatial location information on top of the image for which the spatial information applies. For example, the grid could have location information (coordinates) at every 10th image pixel (N-S) and (E-W). Then for every image pixel, one could interpolate, using surrounding grid pixels, to estimate the actual geospatial location. This scheme eliminates the need to re-sample the base image to place it in a rectified form. This is important if the base image was a map scanned at a relatively low resolution (e.g., 100 dots per inch) and the re-sampling process would tend to make the resultant raster map too blurred to read. This process also allows a very non-linear stretch within the image space to be geo-referenced with reasonable accuracy, for example, aircraft reconnaissance using low scan angles. This results in near field pixels relatively close together and far field pixels far apart. Even with a horizon in the image, one can fill pixel spaces above this horizon with null values to signal that spatial location has no meaning in this empty part of the scene. Another advantage of the grid reference is the simplification of the application software. By using the same grid reference scheme for various types of imagery, the application software can use the same logic and not require a library of algorithms for various projection and sensor parameter solutions.

The extension includes the file identifier (BAD = IID of the grid subfile) of the grid image subfile and precise coordinates of four bounding corners. The Grid Image ID can be found in the Image Subheader, Image ID (IID) field. It also contains the absolute elevation of the grid relative to mean sea level (WGS84). The elevation data provides spatial data refinement in areas where terrain relief complicates the geospatial reference problem. For regions of pronounced differences in terrain elevation, it may be necessary to include several sets of grid reference images where the elevation of the grid is adjusted to best match the terrain elevation over that region.

It is important to note that while the grid reference generally gives good accuracy, the quantitative accuracy value at each pixel is difficult to describe.

The grid image subfile is a NITF subimage containing two bands : Band X giving the longitude or easting coordinates and Band Y giving the latitude or northing coordinates for each grid element. The Band X image file field "ISUBCAT1" may be CGX or GGX and Band Y image file field "ISUBCAT2" may be CGY or GGY. CGX and CGY indicate geographic coordinates (latitude / longitude) and GGX and GGY indicate grid (easting (x) / northing (y)) coordinates.

Let (LSO, PSO) be the origin of the location grid in columns and rows within the image, (LOD, LAD) the interval (measured in image pixels) between 2 consecutive elements of grid (in columns, rows), also being the ratio of image pixels to grid pixels, by column and row.

Let (c,r) be the column and row numbers, of a pixel of interest, within the image. The location of the pixel (c,r) can be interpolated from the four grid points that surround it. Let (LGC, LGR) be the column and row number (in grid numbers) of the upper left corner of the grid square that surrounds the image pixel of interest. These values can be computed as follows:

$$LGC = [\,(c-LSO) / LOD] \qquad\qquad LGR = [\,(r-PSO) / LAD]$$

where... $[x]$ = integer part of x

Let the four corners of the grid square be numbered 1, 2, 3, 4, as shown on figure A-1. The upper left corner (corner number 1) column and row indexes are $(C_1, R_1) = (LGC, LGR)$. The column and row numbers (C_i, R_i), (i = 2, 3, 4) of the other corners are:

$(C_2, R_2) = (LGC+1, LGR)$, $(C_3, R_3) = (LGC, LGR+1)$, $(C_4, R_4) = (LGC+1, LGR+1)$.

For the example in figure A-1 the solutions are:

$(C_1, R_1) = (1,0)$ $(C_2, R_2) = (2,0)$ $(C_3, R_3) = (1,1)$ $(C_4, R_4) = (2,1)$

The image pixel coordinates of the 4 grid corners (c_i, r_i), $(i = 1,2,3,4)$ can be computed as:

$(c_i, r_i) = (LSO + C_i * LOD, PSO + R_i * LAD)$.

For the example the solutions are:

$(c_1, r_1) = (5,3)$ $(c_2, r_2) = (8,3)$ $(c_3, r_3) = (5,7)$ $(c_4, r_4) = (8,7)$

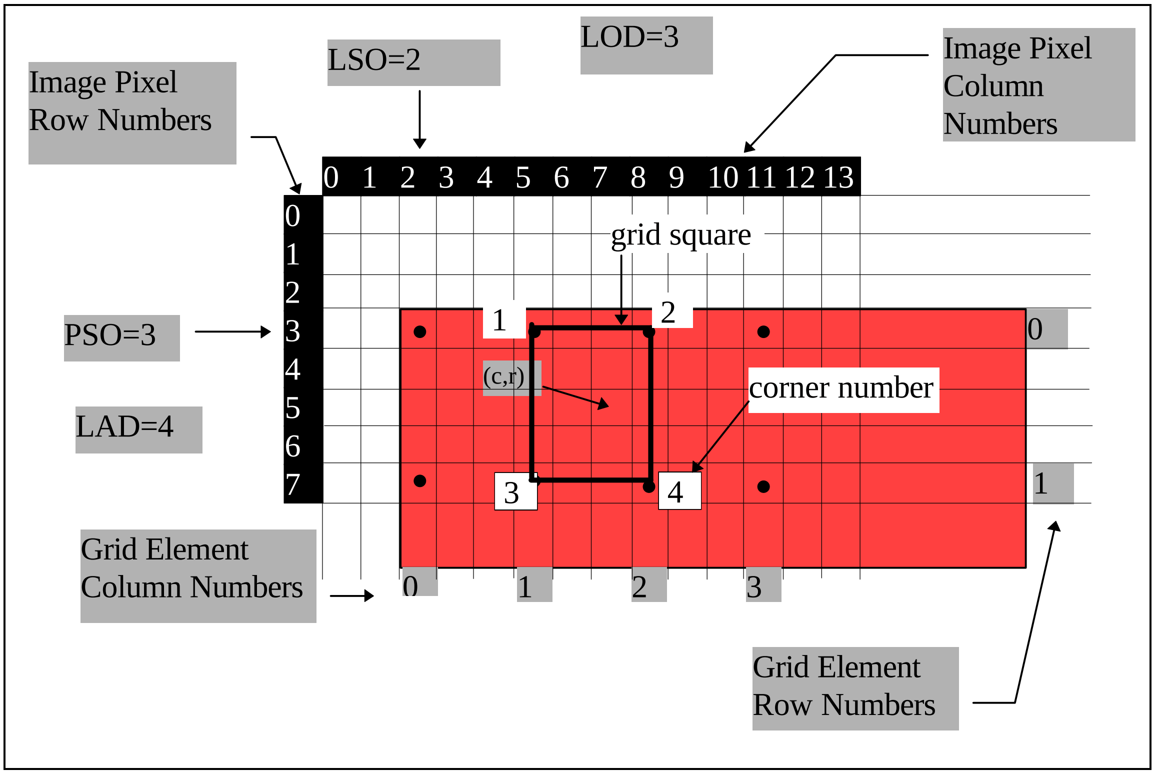

FIGURE A-1. Example of a location grid.

In this example, the pixel of interest is $(c, r) = (7, 5)$.

The location information provided by grid data at each of the four corners (X_i, Y_i), $(i = 1,2,3,4)$ is given by:

$(X_i, Y_i) = (BandX(C_i, R_i), BandY(C_i, R_i))$.

The interpolation algorithm is a bilinear interpolation between the 4 corners of the grid square. The column and row deltas (a and b), for c and r, are computed as follows:

$a = (c - c_1) / LOD = (c - (LSO + C_1 * LOD)) / LOD$
$b = (r - r_1) / LAD = (r - (PSO + R_1 * LAD)) / LAD$

and a and b lie between 0 and 1.

The location (X,Y) of the pixel (c,r) is then given by :

$X = (1- a) * (1- b) * X_1 + a * (1- b) X_2 + (1- a) * b * X_3 + a * b * X_4$

$Y = (1- a) * (1- b) * Y_1 + a * (1- b) Y_2 + (1- a) * b * Y_3 + a * b * Y_4$

For the example, the values of (a and b) are :

$a = (c - c_1) / LOD = (7 - 5) / 3 = 2/3$ and $b = (r - r_1) / LAD = (5 - 3) / 4 = 1/2$

giving the interpolation algorithm the following weighted sum:

$X = X_1/6 + X_2/3 + X_3/6 + X_4/3$

$Y = Y_1 /6 + Y_2/3 + Y_3/6 + Y_4/3$

Note that the sum of the weights (1/6 + 1/3 + 1/6 + 1/3) is always equal to 1.

The coding of bands values BandX and BandY will be :

- either integer for cartographic grids, giving easting and northing (in meters) ; in that case, the values of fields of sub-image header file or location grid data are :

  PVTYPE = INT, NBANDS = 2, IREPBAND1 = LX, ISUBCAT1 = CGX,
  IREPBAND2 = LY, ISUBCAT2 = CGY.
- or real (float) for geographic grids, giving longitude and latitude (in decimal seconds) ; in that case, the values of fields of sub-image header file or location grid data are :

  PVTYPE = R, NBANDS = 2, IREPBAND1 = LX, ISUBCAT1 = GGX,
  IREPBAND2 = LY, ISUBCAT2 = GGY.

Grid and elevation (applies to imagery - not applicable to raster maps)
A grid is computed at a given elevation, and is valid for that elevation. In most cases, the location given by a grid varies smoothly with this elevation.
If the surface covered by the image is flat, its associated grid should be computed at the average ground elevation in this area.
Otherwise in case of significant elevation variations over the spot covered by the grid, the image is associated with two grids, one at minimum elevation $\mathbf{z_{min}}$, and the other at maximum elevation $\mathbf{z_{max}}$. A more accurate location of the pixel of interest can be computed by a linear interpolation between the locations computed with the two grids taking account of the estimated elevation from some additional data (such as digital terrain model or maps).

The process is then the following :
- computing the location with the two grids : (X_{min} , Y_{min}) at elevation z_{min} , (X_{max} , Y_{max}) at elevation $\mathbf{z_{max}}$.

- from an additional data (e.g Digital Terrain Model, map ...), estimation of elevation **z** of pixel (whose location can be estimated as $((X_{min} +X_{max})/2, (Y_{min} +Y_{max})/2)$.

- compute : $\mu = (z - z_{min}) / (z_{max} - z_{min})$ (notice that $0 \le \mu \le 1$).

- compute the final location (X, Y) by linear interpolation :

$(X, Y) = ((1-\mu) X_{min} + \mu X_{max} , (1-\mu) Y_{min} + \mu Y_{max})$

This solution is robust only when the elevation gradient is smooth.

A.4.3.5 Registration points. Each registration point is described by two sets of coordinates: one describes the position of the point using the absolute coordinate system (as described in the GEOPS extension), the other describes the position of the same point in the relative coordinate system (as used in the data set). The REGPT extension is used to support relative coordinate systems. Note: The position accuracy will be affected by the mathematical function used to transform the coordinates from the relative coordinate system to the absolute one. This process is often referred to a "rubber sheeting" or "warping" an image (or scanned raster file) to best fit an absolute coordinate system. The mathematics will obviously be improved if approximate pixel spacing (in terms of the absolute coordinate system) is known.

A.4.3.6 Geo-reference values for certain standard products. Several standard raster map products exist for which the geo-reference values are understood by default. These default values are summarised in this section:

* Arc Standard Raster Products (ASRP)

Type	Geographic (GEO)
Units	Seconds (SEC)
Ellipsoid	WGS84
Datum	WGS84
Projection	ARC (using Zone Number supplied in GEOLO)

* UTM/UPS Standard Raster Products (USRP)

Type	Cartographic (MAP)
Units	Meters (M)
Ellipsoid	WGS84
Datum	WGS84

If Zone Number is +60 to +1 (for north of Equator) or -60 to -1 (for south of Equator) the default projection will be:

Projection	Universe Transverse Mercator
Parameter 1	Central Meridian for UTM Zone (Given in MAPLO)
Parameter 2	0.9996
Parameter 3	None
Parameter 4	None
X(Easting) false origin of projection	500000
Y(Northing) false origin of projection	0(N) or 10000000(S)

consistent with Zone Number given in MAPLO Extension

If Zone Number is +61 or -61 the default projection will be:

Projection	Universal Polar Stereographic
Parameter 1	0 or 648000
Parameter 2	0.994
Parameter 3	None
Parameter 4	None
X(Easting) false origin of projection	2000000
Y(Northing) false origin of projection	2000000

A.4.4 Positional accuracy. Positional accuracy is expressed as a circular error for X,Y-value and as linear error for Z-value according to STANAG 2215.

A.4.4.1 Horizontal and vertical accuracy regions. There must be 100% areal coverage of the geo-referenced image item extent for the total area of the horizontal accuracy regions and 100% areal coverage of the geo-referenced image item extent for the sum of the vertical accuracy regions. Where the information is unknown or not applicable it will be noted with "Not a Number" value. Where the region or sub-region boundaries are coincident with both horizontal and vertical accuracy regions, then the accuracy regions may be combined in the same accuracy support data extension ACCPO. Where the horizontal and vertical boundaries differ in whole or in part, then either totally distinct horizontal and vertical sub-regions may be defined (ACCHZ, ACCVT), or the two approaches may be mixed (e.g., figure A-1).

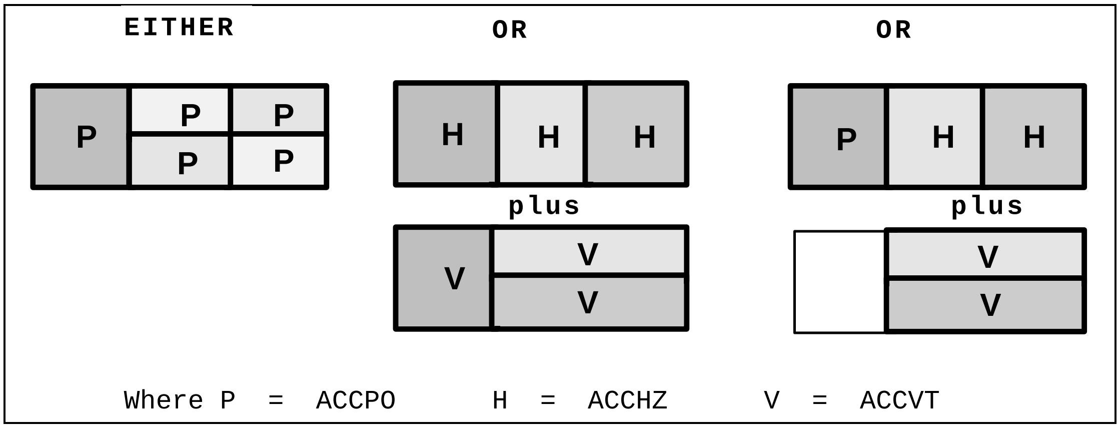

FIGURE A-2. Alternatives for defining mixed positional accuracy areas.

A.5 DETAILED REQUIREMENTS

A.5.1. GEOPS - Geo positioning information. GEOPS defines the absolute coordinate system to which the data is geo-referenced. This absolute coordinate system may be a geographic system or a cartographic coordinate system. The GEOPS extension is detailed in table A-1. A single GEOPS must be placed in the Image Subheader Extended Subheader Data field for each geo-referenced image item in a NITF file.

TABLE A-1. GEOPS - Geo positioning information extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A GEOPS	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 151+NUM_PRJ *15+30	R
The following fields define GEOPS…				
TYP	Type of Coordinate System. Type of Coordinate system for the image data: GEO: longitude, latitude; MAP: Easting, Northing; DIG longitude, latitude or Easting, Northing registered through a location grid or registration points	3	BCS-A MAP, GEO, or DIG	R
UNI	Units of Measure for Coordinates. Units of measure for this data set.	3	BCS-A See Table G-1	R
ELL	Ellipsoid Name. Name of the ellipsoid to which the Data set refers. (See DIGEST 1.2 Part 3 - 10)	25	BCS-A See Table G-1	R
ELC	Ellipsoid Code. Code of the ellipsoid to which the Data set refers.	3	BCS-A See Table G-1	R
DVR	Vertical Datum Name.	25	BCS-A See Table F-3	R
VDCDVR	Vertical Datum Code.	4	BCS-A See Table F-3	R
DAG	Datum Geodetic Name.	25	BCS-A See Table F-2	R
DCD	Datum Geodetic Code.	4	BCS-A See Table F-2	R
GRD	Cartographic Grid Code Code of the Grid system. Defaulted to blank spaces.	3	BCS-A (See Table F-6)	R
GRN	Grid Description Text description of the Grid system. Defaulted to blank spaces	25	BCS-A	R
ZNA	Grid Zone number Necessary when the Grid System comprise more than one zone. Defaulted to 000 otherwise.	3	BCS-N	R
PRN	Projection Name.	25	BCS-A See Table F-5	R
PCO	Projection Code.	2	BCS-A See Table F-5	R
NUM_PRJ	Number of Projection Parameters	1	BCS-N 0-9	R

TABLE A-1. GEOPS - Geo positioning information extension - Continued.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
For each projection parameter…				
PRJ	Projection Parameter (See Table F-5)	15	BDS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	C
…				
NOTE: The following fields are not included in the repetition of fields designated by NUM_PRJ.				
XOR	Projection False X (Easting) Origin.	15	BCS-A See Table F-5	R
YOR	Projection False Y (Northing)Origin.	15	BCS-A See Table F-5	R

A.5.2. GRDPS - Grid reference data. When the image, matrix, or raster data is not rectified, the geographic location of each pixel may be derived from a given set of location grids computed for a given elevation. The user defined fields of the GRDPS extension are detailed in table A-2. A single GRDPS is placed in the Image Subheader, following GEOPS.

TABLE A-2. GRDPS - Grid reference data extensions.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A GRDPS	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field)	5	BCS-N 2 + NUM_GRDS * 68	R
The following fields define GRDPS…				
NUM_GRDS	Number of Location Grids.	2	BCS-N 01-20	R
For each location grid…				
ZVL	Elevation of the Grid (Meters).	10	BCS-N ±zzzzzzzz.	R
BAD	Identifier of the Grid Image ID File.	10	BCS-A	R
LOD	Data Interval in image pixels. (column wise), also being ratio of image pixels to grid elements	5	BCS-N 00001-99999	R
LAD	Data Interval in image pixels. (row wise), also being ratio of image pixels to grid elements	5	BCS-N 00001-99999	R
LSO	Column Number of the Origin of Location Grid.	11	BCS-N	R
PSO	Row Number of the Origin of Location Grid.	11	BCS-N	R
NCOLS	Number of Columns in the Location Grid.	8	BCS-N 00000001-999999999	R
NROWS	Number of Rows in the Location Grid.	8	BCS-N 00000001-999999999	R

A.5.3 GEOLO - Local geographic (lat/long) coordinate system. For rectified data (rows and columns are aligned with the coordinate system axis) GEOLO provides the description of the link between the local coordinate system (rows and columns) and the absolute geographic coordinate system (longitude and latitude). The user defined fields of the GEOLO extension are detailed in table A-3. A single GEOLO is placed in the Image Subheader, following GEOPS.

TABLE A-3. GEOLO - local geographic coordinate system extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A GEOLO	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 00048	R
The following fields define GEOLO…				
ARV	Number of Elements in 360 Degrees (E-W). Pixel ground spacing…number of pixels in 360 degrees (E-W)	9	BCS-N 000000002 - 999999999	R
BRV	Number of Elements in 360 Degrees (N-S). Pixel ground spacing…number of pixels in 360 degrees (N-S)	9	BCS-N 000000002 - 999999999	R
LSO	Longitude of Reference Origin.	15	BCS-N ±ddd.ddddddddd	R
PSO	Latitude of Reference Origin.	15	BCS-N ±0dd.ddddddddd	R

A.5.4 MAPLO - Local cartographic (x, y) coordinate system. For rectified data (rows and columns are aligned with the coordinate system axis) MAPLO provides the description of the link between the local coordinate system (rows and columns) and the absolute cartographic coordinate system (Easting and Northing). The user defined fields of the MAPLO extension are detailed in table A-4. A single MAPLO is placed in the Image Subheader, following GEOPS.

TABLE A-4. MAPLO - local cartographic coordinate system extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A MAPLO	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 00043	R
The following fields define MAPLO …				
LOD	Data Density for E/W Direction. Data interval in E-W direction	5	BCS-N 00001-99999	R
LAD	Data Density for N/S Direction. Data interval in N-S direction	5	00001-99999	R
UNILOA	Units of Measurement of LOD and LAD.	3	BCS-A See Table G-1	R

TABLE A-4. MAPLO - local cartographic coordinate system extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
LSO	Easting of Reference Origin.	15	BCS-N ± mmmmmmmmmmmm.m	R
PSO	Northing of Reference Origin.	15	BCS-N ± mmmmmmmmmmmm.m	R

A.5.5 REGPT - Registration points. Registration points may be provided for image or map data to identify specific pixels in this data and provide spatial locations (geographic or cartographic) for these pixels. With this information the entire image or map pixel set can be adjusted to improve overall accuracy. The extension is called REGPT and table A-5 details the user defined fields.

TABLE A-5. REGPT - Registration point extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A REGPT	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to follow (e.g., length of data in tag data field).	5	(BCS_N) 2 + NUM_PTS * 83	R
The following fields define REGPT…				
NUM_PTS	Number of Registration Points to Follow.	2	BCS-N 01 - 99	R
For each registration point…				
PID	Point Identification.	5	BCS-A	R
LONG	Longitude/Easting of Registration Point.	15	BCS-N ± ddd.dddddd / ± mmmmmmmmmmmm.m	R
LAT	Latitude/Northing of Registration Point.	15	BCS-N ± 0dd.dddddd / ± mmmmmmmmmmmm.m	R
ZVL	Elevation of Registration Point.	15	BCS-N ± mmmmmmmmmmmm.m	R
DIX	Column Number of Registration Point.	11	BCS-N 00000000001- 99999999999	R
DIY	Row Number of Registration Point.	11	BCS-N 00000000001- 99999999999	R
DIZ	Local Z Coordinate of Registration Point.	11	BCS-N ± mmmmmmm.m	R

A.5.6 ACCPO - Positional accuracy. The user defined fields of the ACCPO extension are detailed in table A-6. If horizontal (ACCHZ) and vertical (ACCVT) extensions are used then ACCPO will not be used.

TABLE A-6. ACCPO - Positional accuracy extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A ACCPO	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 2 + NUM_ACPO * (34 + NUM_COO*30)	R
The following fields define ACCPO…				
NUM_ACPO	Number of ACCPO Record Sets to Follow. This field defines the number of accuracy sets to follow. The number will be "01" if the entire data set only has one set of accuracy. If vertical and horizontal accuracy are not homogeneous within definable regions then there may be different numbers of sets between horizontal and vertical. The maximum number of regions is limited to 20.	2	BCS-N 01 - 20	R
For each ACCPO record… (defined by the following fields of ACCPO extension)				
AAH	Absolute Horizontal Accuracy. Absolute horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAAH	Unit of Measure for AAH. Units for AAH (See Table G-1)	3	BCS-A	R
AAV	Absolute Vertical Accuracy. Absolute vertical accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAAV	Unit of Measure for AAV. Units for AAV (See Table G-1)	3	BCS-A	R
APH	Point-to-Point (Relative) Horizontal. Point-to-point (relative) horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAPH	Unit of Measure for APH. Units for APH (See Table G-1)	3	BCS-A	R
APV	Point-to-Point (Relative) Vertical. Point-to-point (relative) vertical accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAPV	Unit of Measure for APV. Units for APV (See Table G-1)	3	BCS-A	R
NUM_COO	Number of Coordinates in Bounding Polygon. This field defined the number of coordinate pairs that are used to define a sub-region. If the accuracy information applies to the entire data set, then this field does not apply and will be zero filled.	2	BCS-N 00-20	R

TABLE A-6. ACCPO - Positional accuracy extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
For each coordinate pair… (the following 2 fields only appear when NUM_COO is not 00)				
LONG	Longitude(DEG)/Easting (M). Longitude or Easting coordinate value (Longitude in decimal degrees and Easting in meters).	15	BCS-N ± ddd.dddddddddd / ± mmmmmmmmmmmm.m	C
LAT	Latitude (DEG)/Northing(M). Latitude or Northing coordinate value (Latitude in decimal degrees and Northing in meters).	15	BCS-N ± 0dd.dddddddddd / ± mmmmmmmmmmmm.m	C

Note 1 : Accuracy values are computed as 90% probable (ref. STANAG 2250).
Note 2 : The coordinate system (Latitude/Longitude or Northing/Easting) is defined in the GEOPS extension.

A.5.7 ACCHZ - Horizontal accuracy. The user defined fields of the ACCHZ extension are detailed in table A-7.

TABLE A-7. ACCHZ - Horizontal extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A ACCHZ	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 2 + NUM_ACHZ * (18 + NUM_COO*30)	R
The following fields define ACCHZ…				
NUM_ACHZ	Number of ACCHZ Record Sets to Follow. This field defines the number of accuracy sets to follow. The number will be "01" if the entire data set only has one set of accuracy. If vertical and horizontal accuracy are not homogeneous within definable regions then there may be different numbers of sets between horizontal and vertical. The maximum number of regions is limited to 20.	2	BCS-N 01 - 20	R
For each ACCHZ record… (defined by the following fields of ACCHZ extension)				
AAH	Absolute Horizontal Accuracy. Absolute horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAAH	Unit of Measure for AAH. Units for AAH (See Table G-1)	3	BCS-A	R
APH	Point-to-point (Relative) Horizontal. Point-to-point (relative) horizontal accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAPH	Unit of Measure for APH. Units for APH (See Table G-1)	3	BCS-A	R

TABLE A-7. ACCHZ - Horizontal extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
NUM_COO	Number of Coordinates in Bounding Polygon. This field defined the number of coordinate pairs that are used to define a sub-region. If the accuracy information applies to the entire data set, then this field does not apply and will be zero filled.	2	BCS-N 00-20	R
For each coordinate pair… (the following 2 fields only appear when NUM_COO is not 00)				
LONG	Longitude(DEG)/Easting (M). Longitude or Easting coordinate value (Longitude in decimal degrees and Easting in meters).	15	BCS-N ±ddd.ddddddddd / ±mmmmmmmmmmmm.m	C
LAT	Latitude (DEG)/Northing (M). Latitude or Northing coordinate value (Latitude in decimal degrees and Northing in meters).	15	BCS-N ±0dd.ddddddddd / ±mmmmmmmmmmmm.m	C

Note 1 : Accuracy values are computed as 90% probable (ref. STANAG 2250).
Note 2 : The coordinate system (Latitude/Longitude or Northing/Easting) is defined in the GEOPS extension.

A.5.8 ACCVT - Vertical accuracy. The user defined fields of the ACCVT extension are detailed in table A-8.

TABLE A-8. ACCVT - Vertical accuracy extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A ACCVT	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 2 + NUM_ACVT * (18 + NUM_COO*30)	R
The following fields define ACCVT…				
NUM_ACVT	Number of ACCVT Record Sets to Follow. This field defines the number of accuracy sets to follow. The number will be "01" if the entire data set only has one set of accuracy. If vertical and horizontal accuracy are not homogeneous within definable regions then there may be different numbers of sets between horizontal and vertical. The maximum number of regions is limited to 20.	2	BCS-N 01 - 20	R
For each ACCVT record… (defined by the following fields of ACCVT extension)				
AAV	Absolute Vertical Accuracy. Absolute vertical accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAAV	Unit of Measure for AAV. Units for AAV (See Table G-1)	3	BCS-A	R

TABLE A-8. ACCVT - Vertical accuracy extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
APV	Point-to-Point (Relative) Vertical. Point-to-point (relative) vertical accuracy for the defined region/sub-region	5	BCS-N 00000-99999	R
UNIAPV	Unit of Measure for APV. Units for APV (See Table G-1)	3	BCS-A	R
NUM_COO	Number of Coordinates in Bounding Polygon. This field defined the number of coordinate pairs that are used to define a sub-region. If the accuracy information applies to the entire data set, then this field does not apply and will be zero filled.	2	BCS-N 00-20	R
For each coordinate pair… (the following 2 fields only appear when NUM_COO is not 00)				
LONG	Longitude (DEG)/Easting (M). Longitude or Easting coordinate value (Longitude in decimal degrees and Easting in meters).	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	C
LAT	Latitude (DEG)/Northing (M). Latitude or Northing coordinate value (Latitude in decimal degrees and Northing in meters).	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	C

Note 1 : Accuracy values are computed as 90% probable (ref. STANAG 2250).
Note 2 : The coordinate system (Latitude/Longitude or Northing/Easting) is defined in the GEOPS extension.

APPENDIX B

MAP SOURCE DATA EXTENSION

B.1 SCOPE

The map source data extension (SOURC) provides extensive information about the source graphics (one or more). Since these sources are maps or charts, a cartographic (MAP) coordinate system applies and must include ellipsoid, datum, and projection data. In addition, if elevation or depth information is present on the source map, the vertical or sounding datum must be supplied.

B.2 APPLICABLE DOCUMENTS

The applicable documents in section 2 MIL-STD-2500B apply to this appendix.

B.3 DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this appendix.

B.4 GENERAL REQUIREMENTS

The source graphic may include several map insets and usually includes legend data that is important to capture as raster files. Insets have a specific coordinate system defined which may be different for each one and different than the one used for the main source graphic. The mechanism is the same as for relative coordinate systems with the four corners of the inset interpreted as registration points. Relative coordinates give the location of the outside of the corners (as computed from the row and column number of each corner). Absolute coordinates will give the location of the inside of the corners. Both locations will be described in the same coordinate system as defined in the GEOPS extension. The only transformation allowed is change of scale and offset.

In northern latitudes, certain maps may include a grid overlay for convenience of navigation where longitude arcs are rapidly converging. The overlays normally include Grid North-Magnetic North Angle (GMA) and a Grid Convergence Angle (GCA). Note: When the primary grid displayed on the map is not strictly registered to the map projection, it is best to use the projection to which the primary grid is registered to the map projection. This allows the application to use the parameters of the source file for transforming the coordinates from the coordinate system of the data set to the coordinate system displayed on the grid.

B.5 DETAILED REQUIREMENTS

B.5.1 SOURC - Map source description. The user defined fields of the SOURC extension are detailed in table B-1, and the descriptions of these fields are detailed in table B-2.

TABLE B-1. SOURC - Source extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A SOURC	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 2 + NUM_SOUR * (312 + NUM_MAG * 74 + 2 + NUM_COO *30 + 28 + NUM_PRJ*15 +90 + NIN *284 + NLI *27)	R
The following fields define SOURC…				
NUM_SOUR	Number of Source Description	2	BCS-N	R
For each source…				
BAD	Identifier of Derived Image layer (Image ID)	10	BCS-A	R
NLI	Number of Legend Images	2	BCS-N	R
NIN	Number of Insets	2	BCS-N	R
PRT	Series Designator	10	BCS-A (e.g. 1501G)	R
URF	Unique Source ID (Number or name which, when used with series and edition, will uniquely identify the source)	20	BCS-A	R
EDN	Source Edition Number	7	BCS-A	R
NAM	Full Name of Source Document	20	BCS-A	R
CDP	Type of Significant Date (that most accurately describes basic date of the product for computation of the probable obsolescence date. It can be compilation date, revision date, or other depending on the product and circumstances.)	3	BCS-N (See Table E-1)	R
CDV	Significant Date Value	8	BCS-A (YYYYMMDD)	R
CDV27	Perishable Information Date Value	8	BCS-A (YYYYMMDD)	R
SCA	Reciprocal Cartographic Scale	9	BCS-N	R
GRD	Cartographic Grid Code Code of the Grid system. Defaulted to blank spaces.	3	BCS-A (See Table F-6)	R
GRN	Grid Description Text description of the Grid system. Defaulted to blank spaces	25	BCS-A	R

TABLE B-1. SOURC - Source extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
ZNA	Grid Zone number Necessary when the Grid System comprise more than one zone. Defaulted to 000 otherwise.	3	BCS-N	R
SQU	Area Coverage (Number of square units in coverage)	10	BCS-N	R
UNISQU	Unit of Measure for SQU	3	BCS-A (See Table F-1)	R
PCI	Predominant Contour Interval	4	BCS-N	R
UNIPCI	Unit of Measure for Contour Interval	3	BCS-A (See Table F-1)	R
WPC	Percentage Covered by Water	3	BCS-N	R
NST	Navigation System Type	3	BCS-N (See Table F-2)	R
ELL	Ellipsoid Name to which the source refers	25	BCS-A (See Table F-1)	R
ELC	Ellipsoid Code	3	BCS-A (See Table F-1)	R
DVR	Datum Vertical Reference	25	BCS-A (See Table F-3)	R
VDCDVR	Code for Datum of Vertical Reference	4	BCS-A (See Table F-3)	R
SDA	Sounding Datum Name	25	BCS-A (See Table F-4)	R
VDCSDA	Code for Sounding Datum	4	BCS-A (See Table F-4)	R
DAG	Geodetic Datum Name	25	BCS-A (See Table F-2)	R
DCD	Geodetic Datum Code	4	BCS-A (See Table F-2)	R
HKE	Highest Known Elevation in Source	6	BCS-N (e.g ±NNNNN)	R
UNIHKE	Units of HKE	3	BCS-A (See Table G-1)	R
LONG	Longitude/Easting of HKE	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	R
LAT	Latitude/Northing of HKE	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	R
NUM_MAG	Number of Sets of Magnetic Information	2	BCS-N 00-20	R
For each set of magnetic information… (the following fields only appear when NUM_MAG is not 00)				
CDP	Type of Date	3	BCS-N (See Table E-1)	R
CDV	Date of Magnetic Information	8	BCS-A (YYYMMDD)	R
RAT	Annual Angular Magnetic Rate of Change (actual real value)	8	BCS-N	R

TABLE B-1. SOURC - Source extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
UNIRAT	Units for Magnetic Rate of Change	3	BCS-A (See Table G-1)	R
GMA	Grid North - Magnetic North Angle (GMA)	8	BCS-N	R
UNIGMA	Units of GMA	3	BCS-A (See Table G-1)	R
LONG	Longitude/Easting Coordinate of GMA Reference Point	15	BCS-N ± ddd.dddddddddd / ± mmmmmmmmmmmm.m	R
LAT	Latitude/Northing Coordinate of GMA Reference Point	15	BCS-N ± 0dd.dddddddddd / ± mmmmmmmmmmmm.m	R
GCA	Grid Convergence Angle (actual real value)	8	BCS-N	R
UNIGCA	Units of GCA	3	BCS-A (See Table G-1)	R
NOTE: The following fields are not included in the repetition of fields designated by NUM_MAG				
NUM_COO	Number of Coordinates in Bounding Polygon	2	BCS-N (04 - 99)	R
For each coordinate…				
LONn	Longitude/Easting of Point	15	BCS-N ± ddd.dddddddddd / ± mmmmmmmmmmmm.m	R
LATn	Latitude/Northing of Point	15	BCS-N ± 0dd.dddddddddd / ± mmmmmmmmmmmm.m	R
….				
NOTE: The following fields are not included in the repetition of fields designated by NUM_COO.				
PRN	Projection Name	25	BCS-A (See Table F-5)	R
PCO	Projection Code	2	BCS-A (See Table F-5)	R
NUM_PRJ	Number of Projection Parameters	1	BCS-N 0-9	R
For each projection parameter…				
PRJ	Projection Parameter See Table F-5	15	BDS-N ± ddd.dddddddddd / ± mmmmmmmmmmmm.m	C
…				
NOTE: The following fields are not included in the repetition of fields designated by NUM_PRJ.				
XOR	X (Easting) False Origin of Projection	15	BCS-N ± mmmmmmmmmmmm.	R
YOR	Y (Northing) False Origin of Projection	15	BCS-N ± mmmmmmmmmmmm.	R
QSS	Security Classification of Source	1	T | S | C | R | U	R
QOD	Originator's Permission Required for Downgrading (Y or N)	1	Y | N	R
CDV10	Downgrading Date Value	8	YYYYMMDD (Blank if QODSS is "Y")	R

TABLE B-1. SOURC - Source extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
QLE	Releasibility (If no release restrictions exits, “UNRESTRICTED” shall be entered)	25	BCS-A	R
CPY	Copyright Statement (If none, “UNCOPYRIGHTED” shall be entered)	25	BCS-A	R

For each inset… (the following fields only appear when NIN is not 00)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
INT	Unique ID for Inset	10	BCS-A	R
SCA	Reciprocal Scale of inset	9	BCS-N	R
NAM	Name of Inset	25	BCS-A	R
NTL	Absolute longitude of lower left corner of inset	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	R
TTL	Absolute latitude of lower left corner	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	R
NVL	Absolute longitude of upper left corner	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	R
TVL	Absolute latitude of upper left corner	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	R
NTR	Absolute longitude of upper right corner	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	R
TTR	Absolute latitude of upper right corner	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	R
NVR	Absolute longitude of lower right corner	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	R
TVR	Absolute latitude of lower right corner	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	R
NRL	Relative longitude of lower left corner	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	R
TRL	Relative latitude of lower left corner	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	R
NSL	Relative longitude of upper left corner	15	BCS-N ±ddd.dddddddddd / ±mmmmmmmmmmmm.m	R
TSL	Relative latitude of upper left corner	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm.m	R

TABLE B-1. SOURC - Source extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
NRR	Relative longitude of upper right corner	15	BCS-N ± ddd.dddddddddd / ± mmmmmmmmmmmm.m	R
TRR	Relative latitude of upper right corner	15	BCS-N ± 0dd.dddddddddd / ± mmmmmmmmmmmm.m	R
NSR	Relative longitude of lower right corner	15	BCS-N ± ddd.dddddddddd / ± mmmmmmmmmmmm.m	R
TSR	Relative latitude of lower right corner	15	BCS-N ± 0dd.dddddddddd / ± mmmmmmmmmmmm.m	R
For each legend… (the following fields only appear when NLI is not 00)				
NAM	Legend name	25	BCS-A	R
BAD	Image file Identifier (Image ID)	2	BCS-N 00 - 99	R
…				

TABLE B-2. SOURC field descriptions.

FIELD	NAME VALUE DEFINITIONS
NUM_SETS	Number of sources
BAD	Name of derived layer (IID)
NLI	Number of legend images
NIN	Number of insets
PRT	Series designator (e.g., 1501G)
URF	Source ID - Number or name which, when used with series and edition, will uniquely identify the source
EDN	Source edition number
NAM	Full name of source document
CDP	Significance date that most accurately describes basic date of the product for computation of the probable obsolescence date. It can be compilation date, revision date, or other depending on the product and circumstances. (See DIGEST, Part 4, Annex B for date codes) (CDP)
CDV	Significant date value
CDV27	Perishable information date value
COU	Country code
SCA	Reciprocal of cartographic scale
GRD	Cartographic grid (See DIGEST part 3-7)
SQU	Number of square units (see below) in coverage
UNIsqu	Units of measure for SQU
PCI	Predominant contour interval
UNIpci	Units of measure for PCI
WPC	Percentage covered by water
NST	Navigation system type
ELL	Ellipsoid name to which the source refers
ELC	Ellipsoid code
DVR	Name of vertical reference
VDCdvr	Code of vertical datum
SDA	Name of sounding datum

TABLE B-2. SOURC field descriptions - Continued.

FIELD	NAME VALUE DEFINITIONS
VCDsda	Code of vertical datum for soundings
DAG	Name of geodetic datum
DCD	Code of geodetic datum
HKE	Highest known elevation on source
UNIhke	Units of measurement for HKE
LON	Longitude/Easting of highest elevation
LAT	Latitude/Northing of highest elevation
NUM_MAG	Number of sets of magnetic rate information
For each set of magnetic rate information…	
CDP	Type of magnetic rate information
CDV	Date of magnetic rate information
RAT	Annual angular rate of change
UNIrat	Units of measurement for RAT
GMA	Grid North - Magnetic North Angle
UNIgma	Units of measurement for GMA
LON	Longitude/Easting of GMA reference point
LAT	Latitude/Northing of GMA reference point
GCA	Grid convergence angle
UNIgca	Units of measurement for GCA
NUM_COO	Number of coordinates in the bounding polygon for the source
For each coordinate in the bounding polygon…	
LON	Longitude/Easting
LAT	Latitude/Northing
PRN	Name of the projection used in the source
PCO	Code for the projection
PAA	Projection parameter no. 1
PAB	Projection parameter no. 2
PAC	Projection parameter no. 3
PAE	Projection parameter no. 4
XOR	X (Easting) false origin of the projection
YOR	Y (Northing) false origin of the projection
QSS	Security classification of source
QOD	Originator's permission needed for downgrading ("Y" or "N")
CDV10	Date of downgrading (Blank if QSS is "Y")
QLE	Releasability restrictions. If no release restrictions exits, "UNRESTRICTED" shall be entered in this entry.
CPY	Copyright statement. If none, "UNCOPYRIGHTED" shall be placed in this entry.
For each inset…	
INT	Unique ID for the inset
SCA	Reciprocal of cartographic scale of inset
NAM	Name of inset
NTL	Absolute longitude of lower left corner of inset
TTL	Absolute latitude of lower left corner
NVL	Absolute longitude of upper left corner
TVL	Absolute latitude of upper left corner
NTR	Absolute longitude of upper right corner
TTR	Absolute latitude of upper right corner
NVR	Absolute longitude of lower right corner

TABLE B-2. SOURC field descriptions - Continued.

FIELD	NAME VALUE DEFINITIONS
TVR	Absolute latitude of lower right corner
NRL	Relative longitude of lower left corner
TRL	Relative latitude of lower left corner
NSL	Relative longitude of upper left corner
TSL	Relative latitude of upper left corner
NRR	Relative longitude of upper right corner
TRR	Relative latitude of upper right corner
NSR	Relative longitude of lower right corner
TSR	Relative latitude of lower right corner
For each legend…	
NAM	Name of legend
BAD	Name of image file (IID)

APPENDIX C

SENSOR PARAMETERS DATA EXTENSION

C.1 SCOPE

This appendix is intended to describe the sensor parameters data extension (SNSPS), containing the image auxiliary data (relevant to the capture of images by a sensor and its associated platform (aircraft, satellite...). These parameters should allow a capture location model of the sensor to accurately compute the location of any pixel of the image.

C.2 APPLICABLE DOCUMENTS

The applicable documents in section 2 MIL-STD-2500B apply to this appendix.

C.3 DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this appendix.

C.4 GENERAL REQUIREMENTS

Hereafter are specified the general parameters defining the attributes of the image, sensor and platform (called basic parameters), that are most currently used. These basic parameters are :

- identification of sensor and platform,
- date and time of capture,
- identification of bands of image at capture stage,
- resolution and pixel spacing (space sampling) at capture stage,
- processing level of image (if any),
- attitude of sensor.

In addition, a way to include specific parameters for one s pecific sensor/platform (called additional auxiliary information) is proposed by giving the related information, for each specific parameter : identification, format, unit and value.

For some sensors, the number of specific parameters can be significant ; in that case, a better solution can be the definition of a dedicated sensor data extension.

C.5 DETAILED REQUIREMENTS

C.5.1 SNSPS - Sensor parameters data extension. The user defined fields of the SNSPS data extension are detailed in table C-1, together with their descriptions. The attitude data are given in a relative orbital referential of the sensor. The additional auxiliary parameters can be either character strings, or integer or float numeric values. The auxiliary parameter value format discriminates between the 3 possible cases. The precision (and unit) of the numeric value allow for the accuracy required by the location model.

TABLE C-1. SNSPS - Sensor parameters data extension.
(TYPE "R" = Required "C" = Conditional)

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CETAG	Unique Extension Identifier.	5	BCS-A SNSPS	R
CEVER	Version.	1	BCS-A A	R
CEL	Length of Data to Follow (e.g., length of data in tag data field).	5	BCS-N 2 + NUM_BAND * 15+ 257 + NUM_AUX * (34 (if APF = I) otherwise 44) + 12 + NUM_COO*30	R
The following fields define SNSPS				
NUM_BAND	Number of Bands of sensor image at capture	2	BCS-N	R
For each band …(the following 3 fields only appear when NUM_BAND is not 00)				
BID	Original Scene Band Identification (original sensor image product)	5	BCS-A	R
WS1	Signal Lower Limit (in Nanometers for Wavelength)	5	BCS-N	R
WS2	Signal Upper Limit (in Nanometers for Wavelength)	5	BCS-N	R
. . .				
REX	Resolution E-W Direction	6	BCS-N	R
REY	Resolution N-S Direction	6	BCS-N	R
GSX[1]	Ground Sample Distance E-W Direction. Ground pixel spacing (sampling) at capture stage measured at pixel GSL.	6	BCS-N	R
GSY	Ground Sample Distance N-S Direction. Ground pixel spacing (sampling) at capture stage measured at pixel GSL.	6	BCS-N	R
GSL	Location of pixel for GSX and GSY	12	BCS-A (e.g UPPER LEFT, LOWER LEFT, UPPER RIGHT, LOWER RIGHT, CENTER)	R
UNIRES	Unit for resolution and ground sample distance	3	BCS-A (See Table G-1)	R
Basic_Auxilliary_Parameters				
PLTFM	Platform Name ex. : SPOT3	8	BCS-A	R
INS	Sensor or Instrument Name ex. : HRV1	8	BCS-A	R
MOD	Spectral Mode ex. : PAN	4	BCS-A	R
PRL	Processing Level ex. : 1A	5	BCS-A	R

[1] GSX can be equal to REX (e.g for SPOT images in PAN mode, REX = GSX = 10 m) or different (e.g for ERS1 SAR PRI images, REX = 27 m, GSX = 12.5 m)

TABLE C-1. SNSPS - Sensor parameters data extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
CDV07	Acquisition Date	8	BCS-A (YYYYMMDD)	R
ACT	Acquisition Time (seconds)	14	BCS-A	R
ANG	Incidence Angle at Original Scene Centre	7	BCS-N)	R
UNIANG	Unit of Incidence Angle	3	BCS-A (See Table G-1)	R
ALT	Altitude of Sensor	9	BCS-N (+/-AAAA.AAA)	R
UNIALT	Unit of Altitude	3	BCS-A (See Table G-1)	R
LON	WGS84 Longitude of Original Scene Centre	10	BCS-N (+/-SSSSSS.SS)	R
LAT	WGS84 Latitude of Original Scene Centre	10	BCS-N (+/-SSSSSS.SS)	R
SAZ	Solar Azimuth at Original Scene Centre	7	BCS-N (+/-DDD.DD)	R
SEL	Solar Elevation at Original Scene Centre	7	BCS-N {+/-DDD.DD}	R
UNISAE	Unit of Solar Angles (Decimal degrees)	3	BCS-A (See Table G-1)	R
ROL	Roll of the Sensor at Original Scene Centre	7	BCS-N {+/-DDD.DD}	R
PIT	Pitch of the Sensor at Original Scene Centre	7	BCS-N {+/-DDD.DD}	R
YAW	Yaw of the Sensor at Original Scene Centre	7	BCS-N {+/-DDD.DD}	R
UNIRPY	Unit of Attitude Angles	3	BCS-A (See Table G-1)	R
PXT	Pixel Time (start time of acquisition)	14	BCS-N	R
UNIPXT	Unit of Pixel Time (S)	3	BCS-A (See Table G-1)	R
ROS	Roll Speed at Original Scene Centre	22	BCS-N	R
PIS	Pitch Speed at Original Scene Centre	22	BCS-N	R
YAS	Yaw Speed at Original Scene Centre	22	BCS-N	R
UNISPE	Unit of Attitude Speed	3	BCS-A (See Table G-1)	R
NUM_AUX	Number of Auxiliary Parameters	2	BCS-N	R
For each additional auxiliary parameter… (the following fields only appear when NUM_AUX is not 00)				
*API	Auxiliary Parameter ID	20		R
APF	Auxiliary Parameter Value Format	1	BCS-A {I | R | A}	R
UNIAPX	Unit of Auxiliary Parameter	3	BCS-A (See Table G-1)	R
APN	Auxiliary Parameter Integer Value	10	BCS-N	C
APR	Auxiliary Parameter Real Value	20	BCS-N	C
APA	Auxiliary Parameter Characters String Value	20	BCS-A	C
BAD	Identifier of Derived Image layer (Image ID)	10	BCS-A	R
NUM_COO	Number of Coordinates in Bounding Polygon	2	BCS-N (04 - 99)	R
For each coordinate…				
LON	Longitude/Easting of Point	15	BCS-N ±ddd.ddddddddd / ±mmmmmmmmmmmm.m	R

TABLE C-1. SNSPS - Sensor parameters data extension - Continued.

FIELD	NAME	SIZE	VALUE RANGE	TYPE
LAT	Latitude/Northing of Point	15	BCS-N ±0dd.dddddddddd / ±mmmmmmmmmmmm. m	R

APPENDIX D

SAMPLE NITF FILE STRUCTURE WITH LOCATION GRIDS

D.1 SCOPE

The example given here is that of NITF file for the exchange of a non rectified image, with 2 associated geographic grids, one at minimum elevation on the image area (GRID1, with ZVL = 100 m), the other at maximum elevation on the image area (GRID2, with ZVL = 200 m).

D.2 APPLICABLE DOCUMENTS

The applicable documents in section 2 MIL-STD-2500B apply to this appendix.

D.3 DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this appendix.

D.4 GENERAL REQUIREMENTS

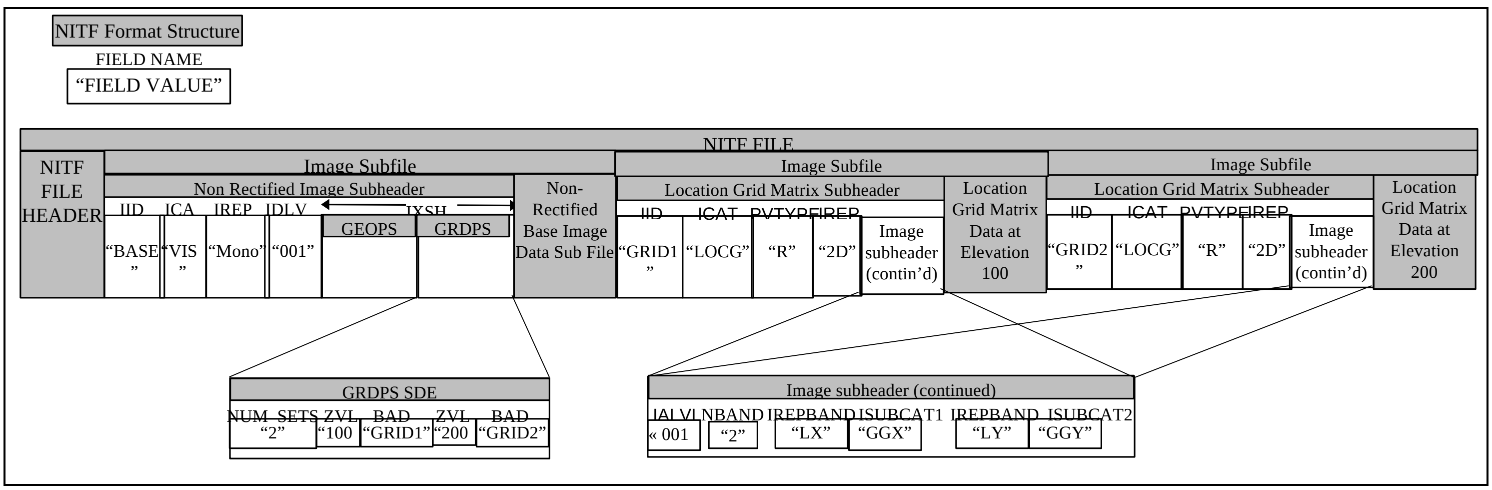

FIGURE D-1. Sample NITF file structure with location grids.

The coding of bands values BandX and BandY of location grid matrix data will be sequential or interleaved depending on IMODE value.

APPENDIX E

DIGEST DATE AND NAVIGATIONAL SYSTEM TYPE

E.1 SCOPE

TBD

E.2 APPLICABLE DOCUMENTS

The applicable documents in section 2 MIL-STD-2500B apply to this appendix.

E.3 DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this appendix.

E.4 GENERAL REQUIREMENTS

E.4.1 DIGEST calendar date type. CDP values give the type of report or activity ; the specified values are (From DIGEST Part 4 - Annex B : FACC Codes) :

TABLE E-1. DIGEST Calendar date type.

VALUE	DEFINITION
0	Unknown
1	Aerial photography
2	Air information
3	Approximate
4	Field classification
5	Compilation
6	Copyright
7	Creation
8	Digitizing
9	Distribution/Dispatching
10	Downgrading
11	Drafting/Scribing/Drawing
12	Edition
13	Field examination
14	Intelligence
15	Date interpretable
16	Processing
17	Print/Publication
18	Receipt
19	Source
20	Earliest date of source
21	Latest date of source
22	Specifications
23	Survey
24	Up-to-dateness/revision
25	Map Edit
26	Information as of ---
27	Perishable information date
28	Cycle date

TABLE E-1. DIGEST Calendar date type - Continued.

VALUE	DEFINITION
29	Significant date
30	Date of magnetic information
999	Other

E.4.2 DIGEST Navigational system type. NST values give the type of equipment or system used in electronic navigation (primary system) ; the specified values are (From DIGEST Part 4 - Annex B : FACC Codes):

TABLE E-2. DIGEST Navigational system type.

VALUE	DEFINITION
0	Unknown
1	Circular Radio Beacon
2	CONSOL
3	DECCA
4	Radio direction finding
5	Directional Radio Beacon
6	Distance finding
7	Long Range Air Navigation System (LORAN)
8	OMEGA
9	Other
10	Radar Responder Beacon (RACON)
11	Radar
12	Radio
13	Radio Telephone
14	VALUE INTENTIONALLY LEFT BLANK
15	TV
16	Microwave
17	Non-Directional Radio Beacon (NDB)
18	NDB / Distance Measuring Equipment (NDB/DME)
19	Radio Range (RNG)
20	VHF Omni Directional Radio Range (VOR)
21	VHF Omni Directional (VOR/DME)
22	VHF Omni Directional (VORTAC)
23	Tactical Air Navigation Equipment (TACAN)
24	Instrument Landing system (ILS)
25	Instrument Landing system / Distance Measuring Equipment (ILS/DME)
26	Localizer (LOC)
27	Localizer / Distance Measuring Equipment (LOC/DME)
28	Simplified Directional Facility (SDF)
29	Landing Distance Available (LDA)
30	Microwave Landing System (MLS)
31	Fan Marker
32	Bone Marker
33	Radio Telegraph
34	Ground Controlled Approach (GCA)
35	Radar Antenna
36	VALUE INTENTIONALLY LEFT BLANK
37	Precision Approach Radar (PAR)

TABLE E-2. DIGEST Navigational system type.

VALUE	DEFINITION
38	Aeronautical Radio
39	VALUE INTENTIONALLY LEFT BLANK
40	Radio Beacon
41	Rotating Loop Radio Beacon
42	Visual Flight Rules (VFR) Test Signal Maker
43	VALUE INTENTIONALLY LEFT BLANK
44	Consol Radio Beacon
45	Radar station
46	Aeronautical Radio Range
47	Hifix
48	Hyperfix
49	Tricolor panel
50	Radio Station
51	Radiobeacon, type unknown
52	None
53	QTG Station (R)
54	Ramark
55	Radar reflector
56	Locator (LO)
57	Localizer (LLZ)
58	Distance Measuring Equipment (DME)
999	Other

APPENDIX F

GEODETIC CODES AND PARAMETERS

F.1 SCOPE

TBD

F.2 APPLICABLE DOCUMENTS

The applicable documents in section 2 MIL-STD-2500B apply to this appendix.

F.3 DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this appendix.

F.4 GENERAL REQUIREMENTS

The 4 main geodetic concepts in this chapter are ellipsoid, datum, projection and grid system.

A geodetic datum includes an ellipsoid as one of its defining components. A grid system includes a datum and a projection among its defining components. The way in which geodetic datum, ellipsoid, grid and projection are inter-related is shown in figure F-1.

Concept Relationship Diagram Each arrow means "… is an input which helps to define …"		
Geodetic Datum	Æ	Grid System
‗		‗
Ellipsoid		Projection

FIGURE F-1. <u>Concept Relationships</u>.

The codes identifying ellipsoid, datum, projection and grid are listed in tables F-1, F-2, F-5 and F-6.

It should be noted that the grid codes in table F-6 are allocated to both grid systems and grid categories. A grid category includes a number of different grids, with variations in geodetic datum and/or zone of application. The most obvious example is Universal Transverse Mercator.

F.5 DETAILED REQUIREMENTS

F.5.1 <u>Ellipsoid codes</u>. The parameters (semimajor axis a and inverse flattening 1/f) are purely to assist ellipsoid identification. The abbreviation "*Alt:*" is used to denote alternative codes originating from DIGEST 1.2, which are included for backward compatibility. In some cases, ellipsoids have come into existence as part of a datum definition. As a result, some ellipsoids are known by the same name as the datum, although the codes will differ. Note the presence of special codes: NO for no ellipsoid, ZY for other known ellipsoid and ZZ for unknown ellipsoid.

TABLE F-1. DIGEST Ellipsoid codes.

ELLIPSOID	PARAMETERS (a, 1/f)	ELLIPSOID CODE
Airy (1830)	(6377563.396, 299.3249647)	AA *Alt:* AAY
US - Modified Airy UK - Airy Modified	(6377340.189, 299.3249647)	AM *Alt:* AAM
Australian National (1966)	(6378160.000, 298.2500000)	AN
APL 4.5 (1968)	(6378144.000, 298.2300000)	AP
Average Terrestrial System 1977	(6378135.000, 298.2570000)	AT
Airy (War Office)	(6377542.178, 299.3250000)	AW
Bessel (Modified)	(6377492.018, 299.1528000)	BM
Bessel 1841 (Namibia)	(6377483.865, 299.1528128)	BN
US - Bessel 1841 (Ethiopia, Indonesia, Japan, Korea) UK - Bessel (1841) Revised	(6377397.155, 299.1528128)	BR
Clarke 1858	(6378235.600, 294.2606768)	CA
Clarke 1858 (Modified)	(6378293.645, 294.2600000)	CB
Clarke 1866	(6378206.400, 294.9786982)	CC *Alt:* CLK
US - Clarke 1880 UK - Clarke 1880 Modified	(6378249.145, 293.4650000)	CD *Alt:* CLJ
Clarke 1880 (Cape)	(6378249.145, 293.4663077)	CE
Clarke 1880 (Palestine)	6378300.782, 293.4663077)	CF
Clarke 1880 (IGN)	(6378249.200, 293.4660208)	CG
Clarke 1880 (Syria)	(6378247.842, 293.4663517)	CI
Clarke 1880 (Fiji)	(6378301.000, 293.4650000)	CJ
Clarke 1880 (Unspecified)	(-,-)	CL
Danish (1876) or Andrae	(6377104.430, 300.0000000	DA
Delambre 1810	(6376985.228, 308.6400000)	DB
Delambre (Carte de France)	(6376985.000, 308.6400000)	DC
US - Everest (India 1830) UK - Everest (1830)	(6377276.345, 300.8017000)	EA
US - Everest (Brunei and E. Malaysia (Sabah and Sarawak)) UK - Everest (Borneo)	(6377298.556, 300.8017000)	EB
US - Everest (India 1956) UK - Everest (India)	(6377301.243, 300.8017000) UK takes 1/f as 300.8017255.	EC
US - Everest (W. Malaysia 1969) UK - Everest (Malaya RSO)	(6377295.664, 300.8017000)	ED
US - Everest (W. Malaysia and Singapore 1948) UK - Everest (Malaya RKT)	(6377304.063, 300.8017000)	EE
Everest (Pakistan)	(6377309.613, 300.8017000)	EF
Everest (Unspecified)	(-,-)	EV
US - Modified Fischer 1960 (South Asia) UK - Fischer 1960 (South Asia)	(6378155.000, 298.3000000)	FA
Fischer 1968	(6378150.000, 298.3000000)	FC
Fischer 1960 (Mercury)	(6378166.000, 298.3000000)	FM
Germaine (Djibouti)	(6378284.000, 294.0000000)	GE

TABLE F-1. DIGEST Ellipsoid codes - Continued.

ELLIPSOID	PARAMETERS (a, 1/f)	ELLIPSOID CODE
Hayford 1909 (6378388.000, 296.9592630)	The original version, based on a = 6378388, b = 6356909.	HA
Helmert 1906	(6378200.000, 298.3000000)	HE
Hough 1960	(6378270.000, 297.0000000)	HO
Indonesian National (1974)	(6378160.000, 298.2470000)	ID
US - International 1924 UK - International	(6378388.000, 297.0000000)	IN *Alt:* INT
Krassovsky (1940)	(6378245.000, 298.3000000)	KA *Alt:* KRA
Krayenhoff 1827	(6376950.400, 309.6500000)	KB
No ellipsoid		NO
NWL-8E	(6378145.000, 298.2500000)	NW
Plessis Modified	(6376523.000, 308.6400000)	PM
Plessis Reconstituted	(6376523.994, 308.6248070)	PR
Geodetic Reference System 1967	(6378160.000, 298.2471674)	RE
Geodetic Reference System 1980	(6378137.000, 298.2572221)	RF
South American	(6378160.000, 298.2500000)	SA
Soviet Geodetic System 1985	(6378136.000, 298.2570000)	SG
Ellipsoid Junction		SJ
Soviet Geodetic System 1990	(6378136.000, 298.2578393)	SN
Struve 1860	(6378298.300, 294.7300000)	ST
Svanberg	(6376797.000, 304.2506000)	SV
Walbeck 1819 (Planheft 1942)	(6376895.000, 302.7821565)	WA
Walbeck 1819 (AMS 1963)	(6376896.000, 302.7800000)	WB
World Geodetic System 1966	(6378145.000, 298.2500000)	WC
World Geodetic System 1972	(6378135.000, 298.2600000)	WD *Alt:* WGC
World Geodetic System 1984	(6378137.000, 298.2572236)	WE *Alt:* WGE
World Geodetic System (Unspecified)	(-,-)	WF
US - War Office 1924 (McCaw) UK - War Office 1924	(6378300.000, 296.0000000)	WO
World Geodetic System 1960	(6378165.000, 298.3000000)	WS
Other Known Ellipsoid		ZY
Unknown Ellipsoid		ZZ

F.5.2 Datum codes. Table F-2 provides the allowable datums and their codes for the Geodetic Datum fields. Sounding Datum and the Vertical Reference System field usage are also covered in the Feature and Attribute Coding Catalogue (Part 4).

In some cases a geodetic datum with a 3-letter code is followed by 4-letter codes referring to the same datum but specifying particular regions. See, for example, codes AINA and AINB which follow AIN. The 4-letter codes are not different datums, but "regional" solutions to the datum. Regional solutions represent regional variations in the relationship between the datum and WGS 1984. Use of the 4-letter code is recommended when there is a need to identify that relationship.

Unless indicated otherwise at the end of the datum name, the Zero Meridian is always Greenwich. Datums with a zero meridian other than Greenwich have "1" as a 4th character in the datum code.

To assist the process of matching ellipsoids to datums, ellipsoid codes are shown in the final column.
The abbreviation "*Alt:*" is used to denote alternative codes originating from DIGEST 1.2, which are included for backward compatibility.

Note the presence of special codes:

- Geodetic Datums (Table F-2): UND for undetermined datum and ZYX for other known datum.
- Sounding Datums (Table F-4): ZYX for other known sounding datum and ZZZ for unknown.

TABLE F-2. DIGEST Geodetic Datum Codes.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
Adindan	**ADI**	CD
Adindan (Ethiopia)	**ADIA**	CD
Adindan (Sudan)	**ADIB**	CD
Adindan (Mali)	**ADIC**	CD
Adindan (Senegal)	**ADID**	CD
Adindan (Burkina Faso)	**ADIE**	CD
Adindan (Cameroon)	**ADIF**	CD
Adindan (Mean value: Ethiopia and Sudan)	**ADIM**	CD
Afgooye (Somalia)	**AFG**	KA
Antigua Island Astro 1943	**AIA**	CD
Ain el Abd 1970	**AIN**	IN
Ain el Abd 1970 (Bahrain Island)	**AINA**	IN
Ain el Abd 1970 (Saudi Arabia)	**AINB**	IN
American Samoa Datum 1962	**AMA**	CC
Amersfoort 1885/1903 (Netherlands)	**AME**	BR
Anna 1 Astro 1965 (Cocos Islands)	**ANO**	AN
Approximate Luzon Datum (Philippines)	**APL**	CC
Arc 1950	**ARF**	CD
Arc 1950 (Botswana)	**ARFA**	CD
Arc 1950 (Lesotho)	**ARFB**	CD
Arc 1950 (Malawi)	**ARFC**	CD
Arc 1950 (Swaziland)	**ARFD**	CD
Arc 1950 (Zaire)	**ARFE**	CD
Arc 1950 (Zambia)	**ARFF**	CD
Arc 1950 (Zimbabwe)	**ARFG**	CD
Arc 1950 (Burundi)	**ARFH**	CD
Arc 1950 (Mean value: Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, and Zimbabwe)	**ARFM**	CD

TABLE F-2. DIGEST Geodetic Datum Codes - Continued.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
Arc 1960	**ARS**	CD
Arc 1960 (Kenya)	**ARSA**	CD
Arc 1960 (Tanzania)	**ARSB**	CD
Arc 1960 (Mean value: Kenya, Tanzania)	**ARSM**	CD
Arc 1935 (Africa)	**ART**	CD
Ascension Island 1958 (Ascension Island)	**ASC**	IN
Montserrat Island Astro 1958	**ASM**	CD
Astro Station 1952 (Marcus Island)	**ASQ**	IN
Astro Beacon "E" (Iwo Jima Island)	**ATF**	IN
Average Terrestrial System 1977, New Brunswick	**ATX**	AT
Australian Geod. 1966 (Australia and Tasmania Is.)	**AUA**	AN
Australian Geod. 1984 (Australia and Tasmania Is.)	**AUG**	AN
Djakarta (Batavia) (Sumatra Island, Indonesia)	**BAT**	BN
Djakarta (Batavia) (Sumatra Island, Indonesia) with Zero Meridian Djakarta	**BAT1**	BN
Bekaa Base South End (Lebanon)	**BEK**	CG
Belgium 1950 System (Lommel Signal, Belgium)	**BEL**	IN
Bermuda 1957 (Bermuda Islands)	**BER**	CC
Bissau (Guinea-Bissau)	**BID**	IN
Bogota Observatory (Colombia)	**BOO**	IN
Bogota Observatory (Colombia) with Zero Meridian Bogota	**BOO1**	IN
Bern 1898 (Switzerland)	**BRE**	BR
Bern 1898 (Switzerland) with Zero Meridian Bern	**BRE1**	BR
Bukit Rimpah (Bangka & Belitung Islands, Indonesia)	**BUR**	BR
Cape Canaveral (Mean value: Florida and Bahama Islands)	**CAC**	CC
Campo Inchauspe (Argentina)	**CAI**	IN
Camacupa Base SW End (Campo De Aviacao, Angola)	**CAM**	CD
Canton Astro 1966 (Phoenix Islands)	**CAO**	IN
Cape (South Africa)	**CAP**	CE
Camp Area Astro (Camp McMurdo Area, Antarctica)	**CAZ**	IN
S-JTSK, Czechoslavakia (prior to 1 Jan 1993)	**CCD**	BN
Carthage (Tunisia)	**CGE**	CG
Compensation Géodétique du Québec 1977	**CGX**	CC
Chatham 1971 (Chatham Island, New Zealand)	**CHI**	IN
Chua Astro (Paraguay)	**CHU**	
Corrego Alegre (Brazil)	**COA**	IN
Conakry Pyramid of the Service Geographique (Guinea)	**COV**	CG
Guyana CSG67	**CSG**	
Dabola (Guinea)	**DAL**	CD
DCS-3 Lighthouse, Saint Lucia, Lesser Antilles	**DCS**	CD
Deception Island, Antarctica	**DID**	CD
GUX 1 Astro (Guadacanal Island)	**DOB**	IN
Dominica Astro M-12, Dominica, Lesser Antilles	**DOM**	
Easter Island 1967 (Easter Island)	**EAS**	IN
Wake-Eniwetok 1960 (Marshall Islands)	**ENW**	HO
European 1950 (Mean value)	**EUR**	IN

TABLE F-2. DIGEST Geodetic Datum Codes - Continued.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
European 1950 (Norway and Finland)	**EURC**	IN
European 1950 (Portugal and Spain)	**EURD**	IN
European 1950 (Cyprus)	**EURE**	IN
European 1950 (Egypt)	**EURF**	IN
European 1950 (England, Channel Islands, Scotland, and Shetland Islands)	**EURG**	IN
European 1950 (Iran)	**EURH**	IN
European 1950 (Sardinia)	**EURI**	IN
European 1950 (Sicily)	**EURJ**	IN
European 1950 (England, Channel Islands, Ireland, Northern Ireland, Scotland, Shetland Islands, and Wales)	**EURK**	IN
European 1950 (Malta)	**EURL**	IN
European 1950 (Mean value: Austria, Belgium, Denmark, Finland, France, Federal Republic of Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, & Switzerland)	**EURM**	IN
European 1950 (Iraq, Israel, Jordan, Kuwait, Lebanon, Saudi Arabia, and Syria)	**EURS**	IN
European 1950 (Tunisia)	**EURT**	IN
European 1979 (Mean value: Austria, Finland, Netherlands, Norway ? Spain, Sweden, and Switzerland)	**EUS**	IN
Oman (Oman)	**FAH**	CD
Observatorio Meteorologico 1939 (Corvo and Flores Islands, Azores)	**FLO**	IN
Fort Thomas 1955 (Nevis, St Kitts, Leeward Islands)	**FOT**	CD
GAN 1970 (Addu Atoll, Republic of Maldives)	**GAA**	IN
Gandajika Base (Zaire)	**GAN**	IN
Geodetic Datum 1949 (New Zealand)	**GEO**	IN
DOS 1968 (Gizo Island, New Georgia Islands)	**GIZ**	IN
Graciosa Base SW (Faial, Graciosa, Pico, Sao Jorge, and Terceira Island, Azores)	**GRA**	IN
Greek Datum, Greece	**GRK**	BR
Greek Geodetic Reference System 1987 (GGRS 87)	**GRX**	RF
Gunong Segara (Kalimantan Island, Indonesia)	**GSE**	BR
Gunong Serindung	**GSF**	BR
Guam 1963	**GUA**	CC
Herat North (Afganistan)	**HEN**	IN
Hermannskogel	**HER**	BR
Provisional South Chilean 1963 (or Hito XVIII 1963) (S. Chile, 53°S)	**HIT**	IN
Hjörsey 1955 (Iceland)	**HJO**	IN
Hong Kong 1963 (Hong Kong)	**HKD**	IN
Hong Kong 1929	**HKO**	CA
Hu-Tzu-Shan	**HTN**	IN
Hungarian 1972	**HUY**	RE
Bellevue (IGN) (Efate and Erromango Islands)	**IBE**	IN
Indonesian 1974	**IDN**	ID
Indian	**IND**	
Indian (Thailand and Vietnam)	**INDA**	

TABLE F-2. DIGEST Geodetic Datum Codes - Continued.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
Indian (Bangladesh)	**INDB**	EA
Indian (India and Nepal)	**INDI**	EC
Indian (Pakistan)	**INDP**	EF
Indian (1954)	**INF**	EA
Indian 1954 (Thailand)	**INFA**	EA
Indian 1960	**ING**	EA
Indian 1960 (Vietnam: near 16°N)	**INGA**	EA
Indian 1960 (Con Son Island (Vietnam))	**INGB**	EA
Indian 1975	**INH**	EA
Indian 1975 (Thailand)	**INHA**	EA
Ireland 1965 (Ireland and Northern Ireland)	**IRL**	AM
ISTS 061 Astro 1968 (South Georgia Islands)	**ISG**	IN
ISTS 073 Astro 1969 (Diego Garcia)	**IST**	IN
Johnston Island 1961 (Johnston Island)	**JOH**	IN
Kalianpur (India)	**KAB**	EC
Kandawala (Sri Lanka)	**KAN**	EA
Kertau 1948 (or Revised Kertau) (West Malaysia and Singapore)	**KEA**	EE
KCS 2, Sierra Leone	**KCS**	WO
Kerguelen Island 1949 (Kerguelen Island)	**KEG**	IN
Korean Geodetic System (Coree Du Sud)	**KGS**	RF
KKJ (or Kartastokoordinaattijarjestelma), Finland	**KKX**	IN
Kusaie Astro 1951	**KUS**	IN
Kuwait Oil Company (K28)	**KUW**	CD
L.C. 5 Astro 1961 (Cayman Brac Island)	**LCF**	CC
Leigon (Ghana)	**LEH**	CG
Liberia 1964 (Liberia)	**LIB**	CD
Lisbon (Castelo di São Jorge), Portugal	**LIS**	
Local Astro.	**LOC**	
Loma Quintana (Venezuela)	**LOM**	IN
Luzon	**LUZ**	CC
Luzon (Philipines except Mindanao Island)	**LUZA**	CC
Luzon (Mindanao Island)	**LUZB**	CC
Marco Astro (Salvage Islands)	**MAA**	IN
Martinique Fort-Desaix	**MAR**	IN
Massawa (Eritrea, Ethiopia)	**MAS**	BR
Manokwari (West Irian)	**MAW**	
Mayotte Combani	**MCX**	
Mount Dillon, Tobago	**MDT**	
Merchich (Morocco)	**MER**	CG
Midway Astro 1961 (Midway Island)	**MID**	IN
Mahe 1971 (Mahe Island)	**MIK**	CD
Minna	**MIN**	CD
Minna (Cameroon)	**MINA**	CD
Minna (Nigeria)	**MINB**	CD
Mannheim (Germany)	**MNM**	
Rome 1940 (or Monte Mario 1940), Italy	**MOD**	IN

TABLE F-2. DIGEST Geodetic Datum Codes - Continued.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
Rome 1940 (or Monte Mario 1940), Italy, with Zero Meridian Rome	**MOD1**	IN
Montjong Lowe	**MOL**	BR
M'Poraloko (Gabon)	**MPO**	CD
Viti Levu 1916 (Viti Levu Island, Fiji Islands)	**MVS**	CD
Nahrwan	**NAH**	CD
Nahrwan (Masirah Island, Oman)	**NAHA**	CD
Nahrwan (United Arab Emirates)	**NAHB**	CD
Nahrwan (Saudi Arabia)	**NAHC**	CD
Naparima (BWI Trinidad and Tobago)	**NAP**	IN
North American 1983	**NAR**	RF
North American 1983 (Alaska, excluding Aleutian Islands)	**NARA**	RF
North American 1983 (Canada)	**NARB**	RF
North American 1983 (CONUS)	**NARC**	RF
North American 1983 (Mexico and Central America))	**NARD**	RF
North American 1983 (Aleutian Islands)	**NARE**	RF
North American 1983 (Hawaii)	**NARH**	RF
North American 1927 (Mean value)	**NAS**	CC
North American 1927 (Eastern US)	**NASA**	CC
North American 1927 (Western US)	**NASB**	CC
North American 1927 (Mean value: CONUS)	**NASC**	CC
North American 1927 (Alaska)	**NASD**	CC
North American 1927 (Mean value: Canada)	**NASE**	CC
North American 1927 (Alberta and British Columbia)	**NASF**	CC
North American 1927 (Newfoundland, New Brunswick, Nova Scotia and Quebec)	**NASG**	CC
North American 1927 (Manitoba and Ontario)	**NASH**	CC
North American 1927 (Northwest Territories and Saskatchewan)	**NASI**	CC
North American 1927 (Yukon)	**NASJ**	CC
North American 1927 (Mexico)	**NASL**	CC
North American 1927 (Central America - Belize, Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua)	**NASN**	CC
North American 1927 (Canal Zone)	**NASO**	CC
North American 1927 (Caribbean, Barbados, Caicos Islands, Cuba, Dominican Republic, Grand Cayman, Jamaica, Leeward Islands, and Turks Islands)	**NASP**	CC
North American 1927 (Bahamas, except San Salvador Island)	**NASQ**	CC
North American 1927 (San Salvador Island)	**NASR**	CC
North American 1927 (Cuba)	**NAST**	CC
North American 1927 (Hayes Peninsula, Greenland)	**NASU**	CC
North American 1927 (Aleutian Islands East of 180°W)	**NASV**	CC
North American 1927 (Aleutian Islands West of 180°W)	**NASW**	CC
New French or Nouvelle Triangulation Française (NTF) with Zero Meridian Paris	**NFR1** *Alt:* **FDA**	CG
North Sahara 1959	**NSD**	CD
Ocotopeque, Guatemala	**OCO**	
Belgium 1972 (Observatoire d'Uccle)	**ODU**	IN

TABLE F-2. DIGEST Geodetic Datum Codes - Continued.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
Old Egyptian (Egypt)	**OEG**	HE
Ordnance Survey of Great Britain	**OGB**	AA
Ordnance Survey G.B. 1936 (England)	**OGBA**	AA
Ordnance Survey G.B. 1936 (England, Isle of Man, and Wales)	**OGBB**	AA
Ordnance Survey G.B. 1936 (Scotland and Shetland Islands)	**OGBC**	AA
Ordnance Survey G.B. 1936 (Wales)	**OGBD**	AA
Ordnance Survey G.B. 1936 (Mean value: England, Isle of Man, Scotland, Shetland, and Wales)	**OGBM**	AA
Old Hawaiian	**OHA**	CC
Old Hawaiian (Hawaii)	**OHAA**	CC
Old Hawaiian (Kauai)	**OHAB**	CC
Old Hawaiian (Maui)	**OHAC**	CC
Old Hawaiian (Oahu)	**OHAD**	CC
Old Hawaiian (Mean value)	**OHAM**	CC
Oslo Observatory (Old), Norway	**OSL**	BR
Padang Base West End (Sumatra, Indonesia)	**PAD**	BR
Padang Base West End (Sumatra, Indonesia) with Zero Meridian Djakarta	**PAD1**	BR
Palestine 1928 (Israel, Jordan)	**PAL**	CF
Potsdam or Helmertturm (Germany)	**PDM**	IN
Ayabelle Lighthouse (Djibouti)	**PHA**	CD
Pitcairn Astro 1967 (Pitcairn Island)	**PIT**	IN
Pico de las Nieves (Canary Islands)	**PLN**	IN
SE Base (Porto Santo) (Porto Santo & Madeira Islands)	**POS**	IN
Provisional South American 1956	**PRP**	IN
Prov. S. American 1956 (Bolivia)	**PRPA**	IN
Prov. S. American 1956 (Northern Chile near 19°S)	**PRPB**	IN
Prov. S. American 1956 (Southern Chile near 43°S)	**PRPC**	IN
Prov. S. American 1956 (Columbia)	**PRPD**	IN
Prov. S. American 1956 (Ecuador)	**PRPE**	IN
Prov. S. American 1956 (Guyana)	**PRPF**	IN
Prov. S. American 1956 (Peru)	**PRPG**	IN
Prov. S. American 1956 (Venezuela)	**PRPH**	IN
Prov. S. American 1956 (Mean value: Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, & Venezuela)	**PRPM**	IN
Point 58 Mean Solution (Burkina Faso and Niger)	**PTB**	CD
Pointe Noire 1948	**PTN**	CD
Pulkovo 1942 (Russia)	**PUK**	KA
Puerto Rico (Puerto Rico and Virgin Islands)	**PUR**	CC
Qatar National (Qatar)	**QAT**	IN
Qornoq (South Greenland)	**QUO**	IN
Rauenberg (Berlin, Germany)	**RAU**	BR
Reconnaissance Triangulation, Morocco	**REC**	CG
Reunion 1947	**REU**	IN
Revised Nahrwan	**NAX**	CD

TABLE F-2. DIGEST Geodetic Datum Codes - Continued.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
RT90, Stockholm, Sweden	**RTS**	BR
Santo (DOS) 1965 (Espirito Santo Island)	**SAE**	IN
South African (South Africa)	**SAF**	CD
Sainte Anne I 1984 (Guadeloupe)	**SAG**	
South American 1969	**SAN**	SA
South American 1969 (Argentina)	**SANA**	SA
South American 1969 (Bolivia)	**SANB**	SA
South American 1969 (Brazil)	**SANC**	SA
South American 1969 (Chile)	**SAND**	SA
South American 1969 (Columbia)	**SANE**	SA
South American 1969 (Ecuador)	**SANF**	SA
South American 1969 (Guyana)	**SANG**	SA
South American 1969 (Paraguay)	**SANH**	SA
South American 1969 (Peru)	**SANI**	SA
South American 1969 (Baltra, Galapagos Islands)	**SANJ**	SA
South American 1969 (Trinidad and Tobago)	**SANK**	SA
South American 1969 (Venezuela)	**SANL**	SA
South American 1969 (Mean value: Argentina, Bolivia, Brazil, Chile, Columbia, Ecuador, Guyana, Paraguay, Peru, Trinidad , Tobago, and Venezuela)	**SANM**	SA
Sao Braz (Sao Miguel, Santa Maria Islands, Azores)	**SAO**	IN
Sapper Hill 1943 (East Falkland Islands)	**SAP**	IN
Schwarzeck (Namibia)	**SCK**	BN
Soviet Geodetic System 1985	**SGA**	SG
Soviet Geodetic System 1990	**SGB**	SG
Selvagem Grande 1938 (Salvage Islands)	**SGM**	IN
Astro Dos 71/4 (St. Helena Island)	**SHB**	IN
Sierra Leone 1960	**SIB**	CD
South Asia (Southeast Asia, Singapore)	**SOA**	FA
S-42 (Pulkovo 1942)	**SPK**	KA
St. Pierre et Miquelon 50	**SPX**	
Stockholm 1938 (Sweden)	**STO**	BR
Sydney Observatory, New South Wales, Australia	**SYO**	CB
Tananarive Observatory 1925	**TAN**	IN
Tananarive Observatory 1925, with Zero Meridian Paris	**TAN1**	IN
Tristan Astro 1968 (Tristan da Cunha)	**TDC**	IN
Timbalai 1948 (Brunei and East Malaysia - Sarawak and Sabah)	**TIL**	EB
Timbali 1968	**TIN**	
Tokyo	**TOY**	BR
Tokyo (Japan)	**TOYA**	BR
Tokyo (Korea)	**TOYB**	BR
Tokyo (Okinawa)	**TOYC**	BR
Tokyo (Mean value: Japan, Korea, and Okinawa)	**TOYM**	BR
Trinidad 1903	**TRI**	CA
Astro Tern Is. 1961 (Tern Island, Hawaii)	**TRN**	IN
Tübingen (Germany)	**TUB**	
Undetermined (processed as if WGS 84)	**UND**	

TABLE F-2. DIGEST Geodetic Datum Codes - Continued.

GEODETIC DATUMS (Horizontal Datums can also be used as Vertical Datums)	DATUM CODE	ELLIPSOID CODE
Voirol 1875	**VOI**	CG
Voirol 1875 with Zero Meridian Paris	**VOI1**	CG
Voirol 1960, Algeria	**VOR**	CG
Voirol 1960, Algeria, with Zero Meridian Paris	**VOR1**	CG
Wake Island Astro 1952	**WAK**	
World Geodetic System 1960	**WGA**	WS
World Geodetic System 1966	**WGB**	WC
World Geodetic System 1972	**WGC**	WD
World Geodetic System 1984	**WGE**	WE
Yacare (Uruguay)	**YAC**	IN
Zanderij (Surinam)	**ZAN**	IN
Other Known Datum	**ZYX**	

TABLE F-3. DIGEST Codes for Vertical Datums.

VERTICAL DATUM REFERENCE	CODE
Geodetic (see Note 1)	GEOD
Mean Sea Level (see Note 2) with identification Example: Mean Sea Level Singapore	MSL

Note 1. All elevations in the dataset are referenced to the ellipsoid of the specified geodetic datum.
Note 2. All elevations in the dataset are referenced to the measured geoid of the specified datum.

TABLE F-4. DIGEST Codes for Sounding Datums.

SOUNDING DATUM	CODE
Approximate Lowest Astronomical Tide	ALAT
Approximate Mean Low Water Tide	AMLLW
Approximate Mean Low Water	AMLW
Approximate Mean Low Water Springs	AMLWS
Approximate Mean Sea Level	AMSL
Chart Datum (Unspecified)	CD
Equinoctial Spring Low Water	ESLW
Highest Astronomical Tide	HAT
Higher High Water Large Tide	HHWLT
Highest Normal High Water	HNHR
Higher High Water	HRHW
Highest High Water	HTHW
High Water	HW
High Water Springs	HWS
International Great Lakes Datum 1985	IGLD
Indian Spring High Water	ISHW
Indian Spring Low Water	ISLW
Lowest Astronomical Tide	LAT
Local Datum (arbitrary datum defined by local harbour authority)	LD
Lower Low Water Large Tide	LLWLT
Lowest Low Water Springs	LLWS
Lower Low Water	LRLW
Lowest Low Water	LTLW

TABLE F-4. DIGEST Codes for Sounding Datums - Continued.

SOUNDING DATUM	CODE
Low Water	LW
Low Water Springs	LWS
Mean Higher High Water	MHHW
Mean Higher Water	MHRW
Mean High Water	MHW
Mean High Water Neaps	MHWN
Mean High Water Springs	MHWS
Mean Lower Low Water	MLLW
Mean Lower Low Water Springs	MLLWS
Mean Low Water	MLW
Mean Low Water Neaps	MLWN
Mean Low Water Springs	MLWS
Mean Sea	MSL
Mean Tide Level	MTL
Nearly Lowest Low Water	NLLW
Neap Tide	NT
Spring Tide	ST
VALUE INTENTIONALLY LEFT BLANK	VILB
Other Known Sounding Datum	ZYX
Unknown	ZZZ

F.5.3 Projection code and parameters. Table F-5 provides the allowable projections and their codes and parameters for the Dataset Map Projection Group. These codes and parameters are necessary for conversion of geographic coordinates to/from grid coordinates (as used on a map). Note that Easting False Origin and Northing False Origin are also needed.

The abbreviation "*Alt:*" is used to denote alternative codes originating from DIGEST 1.2, which are included for backward compatibility.

Note the presence of a special code ZY for other known projection.

TABLE F-5. DIGEST Projection Codes and Parameters.

PROJECTION	PROJ'N CODE	PARAMETERS			
		1	2	3	4
Albers Equal-Area Conic	AC	Longitude of Origin	Std. Parallel Nearer to Equator	Std. Parallel Farther from Equator	Latitude of Origin *(see Note 5)*
(Lambert) Azimuthal Equal-Area	AK	Longitude of Proj. Origin	Latitude of Proj. Origin	-	-
Azimuthal Equidistant	AL	Longitude of Proj. Origin	Latitude of Proj. Origin	-	-
Bonne	BF	Longitude of Proj. Origin	Latitude of Proj. Origin	Scale Factor at Proj. Origin	-
Equirectangular (La Carte Parallélogramatique)	CC	Longitude of Central Meridian	Latitude of True Scale	-	-

TABLE F-5. DIGEST Projection Codes and Parameters - Continued.

PROJECTION	PROJ'N CODE	PARAMETERS			
		1	2	3	4
Equidistant Conic with 1 Standard Parallel	CP	Longitude of Central Meridian	Latitude of Proj. Origin	Latitude of Standard Parallel	-
Cassini-Soldner	CS	Longitude of Proj. Origin	Latitude of Proj. Origin	-	-
Gnomonic	GN	Longitude of Proj. Origin	Latitude of Proj. Origin	-	-
Hotine Oblique Mercator based on 2 Points	HX	Scale Factor at Proj. Origin	Latitude of Proj. Origin	Longitude of 1st Point defining Central Line	Latitude of 1st Point defining Central Line
(Note the 5th and 6th Parameters shown right.)		Longitude of 2nd Point defining Central Line	Latitude of 2nd Point defining Central Line	-	-
Equidistant Conic with 2 Standard Parallels	KA	Longitude of Central Meridian	Latitude of Origin *(see Note 5)*	Latitude of Standard Parallel Nearer to Equator	Latitude of Standard Parallel Farther from Equator
Laborde	LA	Longitude of Proj. Origin	Latitude of Proj. Origin	Scale Factor at Proj. Origin	-
Lambert Conformal Conic *(see Note 1)*	LE	Longitude of Origin	Std. Parallel Nearer to Equator	Std Parallel Farther from Equator	Latitude of Origin *(see Note 5)*
Lambert Equal-Area Meridional	LJ	Longitude of Central Meridian	Latitude of Proj. Origin	-	-
Mercator	MC	Longitude of Central Meridian	Latitude of True Scale	-	-
Miller Cylindrical	MH	Longitude of Central Meridian	Radius of Sphere *(see Note 2)*	-	-
French Lambert	MJ	Longitude of Proj. Origin	Latitude of Proj. Origin	Scale Factor at Proj. Origin	-
New Zealand Map Grid	NT	Longitude of Proj. Origin	Latitude of Proj. Origin	-	-
Oblique Mercator	OC	Longitude of Reference Point on Great Circle	Latitude of Reference Point on Great Circle	Azimuth of Great Circle at Reference Point	-
Orthographic	OD	Longitude of Proj. Origin	Latitude of Proj. Origin	-	-

TABLE F-5. DIGEST Projection Codes and Parameters - Continued.

PROJECTION	PROJ'N CODE	PARAMETERS			
		1	2	3	4
Polar Stereographic	PG	Central Meridian (Longitude straight down from Pole on map)	Latitude of True Scale	-	-
Polyconic	PH	Longitude of Central Meridian	Latitude of Proj. Origin	-	-
Relative Coordinates	RC	X-Scale Factor	Y-Scale Factor	-	-
Hotine Oblique Mercator (Rectified Skew Orthomorphic)	RS *Alt:*RB	Longitude of Proj. Origin	Latitude of Proj. Origin	Azimuth East of North for Central Line (Skew X-Axis) at Proj. Origin	Scale Factor at Proj. Origin
Robinson	RX	Longitude of Central Meridian	Radius of Sphere *(see Note 2)*	-	-
Sinusoidal	SA	Longitude of Central Meridian	Radius of Sphere *(see Note 2)*	-	-
Oblique Stereographic	SD	Longitude of Origin	Latitude of Origin	Scale factor at Origin	-
Space Oblique Mercator	SX	Application Code *(see Note 3)*	Vehicle Number *(see Note 4)*	Orbital Path Number *(see Note 4)*	
Transverse Mercator	TC	Longitude of Central Meridian	Central Scale Factor	Latitude of Origin *(see Note 5)*	-
Van der Grinten	VA	Longitude of Central Meridian	Radius of Sphere *(see Note 2)*	-	-
General Vertical Near-Side Perspective	VX	Longitude of Proj. Origin	Latitude of Proj. Origin	Height of Perspective Point above Surface (in metres)	-
Other Known Projection	ZY	-	-	-	-

Note 1. The parameters of the Lambert Conformal Conic projection are based on the version derived from 2 Standard Parallels. Where the projection is derived from a single standard parallel with a scale factor, data producers need to compute the equivalent parameters for the 2-standard-parallel case.

Note 2. This radius can be omitted if the chosen sphere has the same surface area as the chosen ellipsoid. The radius R which has that property may be derived from the ellipsoid parameters as follows:
Compute e^2 and e from $e^2 = 2*f - f^2$.

$$Qp = 1 - \mathbf{(}(1-e^2)/(2*e)\mathbf{)}*Ln\mathbf{(}(1-e)/(1+e)\mathbf{)}.$$

$$R = a*Sqrt(Qp/2).$$

Note 3. Application Code:

1 = “Landsat, USGS equations”.
2 = “Landsat, EOSAT equations”.
(Other values to be added as and when required.)

Note 4. These parameters combined with the Application Code determine the mathematical parameters used in the projection.

Note 5. The Origin included here is the point where Easting False Origin and Northing False Origin are applied, rather than the Projection Origin.

F.5.4 Grid codes. Table F-6 provides the allowable grids and their codes for the Grid System field. To assist the process of matching datums and projections to grids, datum codes and projection codes are shown in the last 2 columns.

It should be noted that some of the entries are **grid categories**, that is to say there is more than one possible grid. This can be due to more than one possible datum or more than one possible zone, or indeed both. In a small number of cases, a grid category covers zones which use different projections. Grid categories are marked with an asterisk (*).

In the context of a DIGEST dataset, the possible ambiguity of a grid category is resolved when the datum, projection and the values of the projection parameters are specified. Zone number may also be specified to improve identification.

Note the presence of special code MS for other known grid.

TABLE F-6. DIGEST Grid Codes.

GRID DESCRIPTION	GRID CODE	DATUM CODE	PROJ’N CODE
Aden Zone	**AD**		LE
Afghanistan Gauss-Krüger Grid	**AF**		TC
Air Defense Grid	**AG**		
Air Support Grid	**AI**		
Alabama Coordinate System * *(see Note 2)*	**AJ**		TC
Alaska Coordinate System * *(see Notes 1 and 2)*	**AK**		
Algeria Zone *	**AL**		MJ
Albania Bonne Grid	**AM**		BF
Alpha-Numeric (Atlas) Grid	**AN**		
Arbitrary Grid	**AO**		
American Samoa Coordinate System *	**AP**		LE
Argentine Gauss-Krüger Conformal Grid *	**AQ**		TC
Artillery Referencing System	**AR**		
Arizona Coordinate System * *(see Note 2)*	**AS**		TC
Australia Belt *	**AU**		TC
Arkansas Coordinate System * *(see Note 2)*	**AV**		LE
Australian Map Grid *	**AW**		TC
Azores Gauss Conformal Grid	**AX**	LOC	TC
Azores Zone	**AZ**	LOC	LE
Baku 1927 Coordinate System	**BA**		
Bavaria Soldner Coordinate System	**BB**		
Belgium Lambert Grid *	**BC**		
Belgium Bonne Grid	**BE**		BF

TABLE F-6. DIGEST Grid Codes - Continued.

GRID DESCRIPTION	GRID CODE	DATUM CODE	PROJ'N CODE
Brazil Gauss Conformal Grid *	**BF**		TC
Soldner-Berlin (Müggelberg) Grid	**BL**	RAU	
Borneo Rectified Skew Orthomorphic Grid *	**BO**		RS
British West Indies Grid *	**BW**		TC
California Coordinate System * *(see Note 2)*	**CB**		LE
Canada British Modified Grid	**CD**		
Ceylon Belt (Transverse Mercator)	**CE**	IND	TC
Canary Islands (Spanish Lambert Grid)	**CF**		
Chile Gauss Conformal Grid *	**CG**		TC
China Belt *	**CH**		TC
Canary Islands Zone	**CI**		LE
China Lambert Zone	**CJ**		LE
Colorado Coordinate Zone * *(see Note 2)*	**CK**		LE
Connecticut Coordinate System *	**CM**		LE
Caspian Zone	**CN**		LE
Costa Rica Lambert Grid	**CO**	OCO	LE
Crimea Grid	**CQ**		LE
Crete Zone	**CR**		LE
Cuba Lambert Grid *	**CT**	NAS	LE
Caucasus Zone	**CU**	NAH	LE
Cape Verde Islands Zone	**CV**		LE
British Cassini Grid *	**CW**	OGB	CS
Czechoslovak Uniform Cadastral Coordinate System	**CX**		
Cyprus Grid *	**CY**		CS
Czechoslovak Military Grid	**CZ**	HER	OG
Danube Zone	**DA**	GRK	LE
Dahomey Belt	**DB**		
Denmark General Staff Grid	**DC**		
Delaware Coordinate System *	**DD**		TC
Dominican Lambert Grid	**DE**		LE
Denmark Geodetic Institute System 1934	**DJ**		BE
Cape Verde Peninsula Grid	**DK**		
East Africa Belt *	**EA**		TC
English Belt	**EB**		TC
Egypt Gauss Conformal Grid *	**ED**		TC
El Salvador Lambert Grid	**EE**		LE
Estonian Grid	**EF**		
Hungarian Unified National Mapping System (EOTR)	**EO**	HUY	TC
Egypt Purple Belt	**EP**		TC
Egypt Red Belt *	**ER**		TC
Egypt 35 Degree Belt	**ET**	OEG	
Fernando Poo Gauss Grid	**FA**		
Fiji Grid	**FB**		
Florida Coordinate System * *(see Notes 1 and 2)*	**FC**		
French Bonne Grid	**FD**		BF
French Guiana Gauss Grid	**FE**		TC
French Somaliland Gauss-Laborde Grid	**FF**		
French Indochina Grid	**FI**		

TABLE F-6. DIGEST Grid Codes - Continued.

GRID DESCRIPTION	GRID CODE	DATUM CODE	PROJ'N CODE
Franz Josef Land Zone	**FJ**		LE
French Lambert Grid *	**FL**		MJ
Formosa (Taiwan) Gauss-Schreiber Coordinate System	**FO**		
French Equatorial Africa Grid	**FS**		
Gabon Belt *	**GA**		TC
Gauss-Boaga Grid (Transverse Mercator)	**GB**	EUR	TC
Gabon Gauss Conformal Grid	**GC**		TC
Geographic Reference System (GEOREF) *	**GE**		
Guadeloupe Gauss-Laborde Grid	**GF**		
Colombia Gauss Conformal Grid	**GG**	BOO	TC
Sweden Gauss-Hannover Grid	**GH**		TC
Georgia Coordinate System * *(see Note 2)*	**GI**		TC
Gauss-Krüger Grid (Transverse Mercator) *	**GK**		TC
Greece Azimuthal Grid	**GL**		
German Army Grid (DHG) *	**GN**		TC
Ghana National Grid	**GO**		TC
Greece Bonne Grid	**GP**		BF
Greece Conical Mecklenburg Coordinates	**GQ**		LE
Greece Conical Mecklenburg Coordinate (New Numbering)	**GR**		LE
Greenland Lambert Grid	**GT**	NAS	LE
Guinea Zone	**GU**		LE
Guam Coordinate System	**GV**		
Guatemala Lambert Grid	**GW**		LE
Guyana Transverse Mercator Grid	**GY**	LOC	TC
Haiti Lambert Grid	**HB**		LE
Hawaii Coordinate System * *(see Note 2)*	**HC**		TC
Hawaii Grid	**HD**		
Honduras Lambert Grid	**HE**		LE
Hong Kong New System Cassini Grid	**HF**	HKO	CS
Hungary Stereographic Grid	**HG**	LOC	
Hong Kong Colony Grid	**HR**		
Idaho Coordinate System * *(see Note 2)*	**IA**		TC
Illinois Coordinate System * *(see Note 2)*	**IB**		TC
Indiana Coordinate System * *(see Note 2)*	**IC**		TC
Indonesia Mercator Grid	**ID**		MC
Indonesia Polyhedric Grid *	**IE**		
Iowa Coordinate System * *(see Note 2)*	**IF**		LE
Ivory Coast Azimuthal Grid	**IG**		
Irish Cassini Grid	**IH**	EUR	CS
Ivory Coast Belt	**IJ**		
Irish Transverse Mercator Grid	**IK**	IRL	TC
Iceland New Lambert Zone	**IL**	HJO	LE
India Zone *	**IN**		LE
Iberian Peninsula Zone	**IP**		LE
Iraq Zone *	**IQ**		LE
Iraq National Grid	**IR**		TC
Italy Zone *	**IT**		LE

TABLE F-6. DIGEST Grid Codes - Continued.

GRID DESCRIPTION	GRID CODE	DATUM CODE	PROJ'N CODE
Ivy - Found on an HA in Marshall Islands	**IY**		
Iceland Zone	**IZ**	HJO	LE
Jamaica Foot Grid	**JA**		LE
Japan Plane-Rectangular Coordinate System	**JB**		
Japan Gauss-Schreiber Grid	**JC**		
Jamaica National Grid (metric)	**JM**		LE
Johore Grid	**JO**		CS
Austria Gauss-Krüger Grid	**KA**		TC
Bulgaria Gauss-Krüger Grid	**KB**		TC
Katanga Grid	**KC**		
Kansas Coordinate System * *(see Note 2)*	**KD**		LE
Kentucky Coordinate System * *(see Note 2)*	**KE**		LE
Finland Gauss-Krüger Grid	**KF**		TC
German Gauss-Krüger Grid	**KG**		TC
Kenya Colony Grid	**KH**		CS
Korea Gauss-Schreiber Coordinate System	**KJ**		
Louisiana Coordinate System * *(see Note 2)*	**KK**		LE
Lithuania Gauss-Krüger Grid	**KL**		TC
Kwantung Province Grid	**KN**		
Turkey Gauss-Krüger Grid	**KT**		TC
Kwangsi Province Grid	**KW**		
Luxembourg Gauss-Krüger Grid	**KX**	EUR	TC
Lambert Conformal Conic Grid *	**LC**		
Latvia Coordinate System	**LD**		
Levant Zone	**LE**	EUR	MJ
Levant Stereographic Grid	**LF**		
Liberia Rectified Skew Orthomorphic Grid	**LG**		RS
Libya Zone	**LI**	EUR	LE
Sirte (Libya) Lambert Grid	**LL**		LE
Malaya Grid *	**MA**		CS
Malta Belt	**MB**	LOC	TC
Maldive-Chagos Belt	**MC**		TC
Madiera Zone	**MD**		LE
Mediterranean Zone *	**ME**		LE
Maine Coordinate System * *(see Note 2)*	**MF**		TC
Malaya Rectified Skew Orthomorphic (Yard) Grid	**MG**	KEA	RS
Martinique Gauss Grid	**MH**		TC
Maryland Coordinate System *	**MI**		LE
Massachusetts Coordinate System * *(see Note 2)*	**MJ**		LE
Mexican Lambert Grid	**MK**		LE
Michigan Coordinate System * *(see Notes 1 and 2)*	**ML**		
Mecca-Muscat Zone	**MM**		LE
Minnesota Coordinate System * *(see Note 2)*	**MN**		LE
Madagascar Grid (Laborde)	**MO**	TAN	LA
Mississippi Coordinate System * *(see Note 2)*	**MP**		TC
Morocco Zone *	**MQ**		MJ
Other Known Grid	**MS**		
Missouri Coordinate System * *(see Note 2)*	**MT**		TC

TABLE F-6. DIGEST Grid Codes - Continued.

GRID DESCRIPTION	GRID CODE	DATUM CODE	PROJ'N CODE
Mauritius Zone	**MU**		LE
Montana Coordinate System * *(see Note 2)*	**MV**		LE
Mozambique Lambert Grid	**MW**		LE
Mozambique Polyconic Grid	**MX**		PH
Northwest Africa Zone	**NA**	MER	LE
New Jersey Coordinate System *	**NB**		TC
Nigeria Colony Belt *	**NC**		TC
National Grid of Great Britain	**ND**	OGB	TC
Northern European Zone *	**NE**		LE
Nebraska Coordinate System * *(see Note 2)*	**NF**		LE
Numeric Grid	**NG**		
New Hampshire Coordinate System *	**NH**		TC
Niger Zone	**NI**		LE
Netherlands Stereographic Grid (Old Numbering)	**NJ**		
North Korea Gauss-Krüger Grid	**NK**		TC
Netherlands Stereographic Grid (New Numbering)	**NL**	PDM	
Netherlands East Indies Equatorial Zone British Metric Grid (Lambert) *	**NM**		MC
Nord de Guerre Zone *	**NO**		MJ
New Mexico Coordinate System * *(see Note 2)*	**NN**		TC
Nevada Coordinate System * *(see Note 2)*	**NP**		TC
New Sierra Leone Colony Grid *	**NQ**		
New York Coordinate System * *(see Notes 1 and 2)*	**NR**		
Netherlands East Indies Southern Zone	**NS**		LE
New Zealand Map Grid (NZMG)	**NT**	GEO	NT
Nicaragua Lambert Grid *	**NU**		LE
Niger Belt	**NV**		LE
North Carolina Coordinate System *	**NW**		LE
North Dakota Coordinate System * *(see Note 2)*	**NX**		LE
Netherlands East Indies Equatorial Zone U.S. Yard Grid *	**NY**		LE
New Zealand Belt *	**NZ**		TC
Northern Malaya Grid	**OA**		
Norway Gauss-Krüger Grid *	**OB**	OSL	TC
Ohio Coordinate System * *(see Note 2)*	**OD**		LE
Oklahoma Coordinate System * *(see Note 2)*	**OE**		LE
Orange Report Net	**OR**	NAS	
Oregon Coordinate System * *(see Note 2)*	**OS**		LE
Palestine Belt *	**PA**		TC
Panama Lambert Grid	**PB**		LE
Palestine Civil Grid (Cassini) *	**PC**		CS
Paraguay Gauss-Krüger Grid	**PD**		TC
Peiping Coordinate System of 1954	**PE**		
Pennsylvania Coordinate System * *(see Note 2)*	**PF**		LE
Peru Polyconic Grid	**PI**		PH
Philippine Plane Coordinate System	**PJ**	LUZ	PH
Poland Gauss-Krüger Grid	**PK**		TC
Poland Quasi-Stereographic Grid	**PL**		

TABLE F-6. DIGEST Grid Codes - Continued.

GRID DESCRIPTION	GRID CODE	DATUM CODE	PROJ'N CODE
Philippine Polyconic Grid	**PP**	APL	PH
Portugal Bonne Grid, Old	**PQ**		BF
Portugal Bonne Grid, New	**PR**		BF
Portugal Gauss Grid	**PS**	LIS	TC
Puerto Rico & Virgin Islands Coordinate System *	**PT**		LE
Puerto Rico Lambert Grid	**PU**		LE
Qatar Cassini Grid	**QA**		CS
Qatar Peninsula Grid (or Qatar National Grid (TM))	**QU**	QAT	TC
Russian Belt *	**RB**	EUR	TC
Reunion Gauss Grid	**RC**		TC
Rhode Island Coordinate System *	**RD**		TC
Romania Bonne Grid	**RE**		BF
Soviet Coordinate System of 1942 *	**RF**	PUK	TC
Romania Lambert-Cholesky Grid	**RH**		
Rikets National Grid *	**RK**	STO	TC
Romania Stereographic Grid	**RI**		SD
Pulkovo Coordinate System of 1932	**RT**		
South Africa Belt (yards) *	**SA**		TC
Senegal Gauss Conformal Grid (Belt)	**SB**		TC
South Africa Coordinate System (South Africa Belt (English feet)) *	**SD**		TC
Senegal Belt	**SE**		TC
South Carolina Coordinate System * *(see Note 2)*	**SF**		LE
Sahara Zone	**SH**		LE
South Dakota Coordinate System * *(see Note 2)*	**SI**		LE
South Libya Zone	**SJ**		LE
Sarawak Grid	**SK**		CS
Spain Lambert Grid	**SL**	EUR	LE
Southern New Guinea Grid *	**SN**		LE
South Georgia Lambert Grid	**SQ**		LE
South Syria Lambert Grid	**SR**		LE
Spanish North-Morocco Lambert Grid	**SS**		LE
Svalbard Gauss-Krüger Grid	**SV**		TC
Svobodny 1935 Coordinate System	**SX**		
Seychelles Belt	**SY**		TC
Spitzbergen Zone	**SZ**		LE
Tanganyika Territorial Grid	**TA**		
Tashkent 1875 Coordinate System	**TB**		
Tennessee Coordinate System *	**TC**		LE
Texas Coordinate System * *(see Note 2)*	**TD**		TC
Tobago Grid	**TE**	MDT	CS
Trinidad Grid	**TF**		CS
Trucial Coast Cassini Grid	**TG**		CS
Trucial Coast Transverse Mercator Grid	**TH**		TC
Turkey Bonne Grid	**TI**		BF
Tunisia Zone *	**TN**		MJ
Uganda Cassini Coordinate System *	**UA**		CS
Unidentified Grid	**UB**		

TABLE F-6. DIGEST Grid Codes - Continued.

GRID DESCRIPTION	GRID CODE	DATUM CODE	PROJ'N CODE
Uruguay Gauss-Krüger Grid	**UC**		TC
Utah Coordinate System * *(see Note 2)*	**UD**		LE
Universal Polar Stereographic System * *(Note: 61 is recommended Zone Number for Northern Polar Zone, -61 for Southern Polar Zone)*	**UP**		PG
U.S. Polyconic Grid System	**US**	NAS	PH
Universal Transverse Mercator * *(Note: 1 to 60 are recommended Zone Numbers for Northern Zones, -1 to -60 for Southern Zones)*	**UT**		TC
Vermont Coordinate System *	**VA**		TC
Virginia Coordinate System * *(see Note 2)*	**VB**		LE
Venezuela Modified Lambert Grid	**VE**		
Vietnam Azimuthal Grid	**VI**		
West Malaysia Rectified Skew Orthomorphic (Metric) Grid	**WA**		RS
Switzerland Bonne Grid	**WB**		BF
Switzerland Conformal Oblique Cylindrical Grid	**WC**		OC
West Virginia Coordinate System *	**WD**		LE
Wisconsin Coordinate System *	**WE**		LE
Wyoming Coordinate System *	**WF**		TC
Washington Coordinate System * *(see Note 2)*	**WH**		TC
World Polyconic System	**WP**		PH
Yugoslavia Gauss-Krüger Grid (Not Reduced)	**YA**	HER	TC
Yugoslavia Reduced Gauss-Krüger Grid	**YG**	HER	TC
Yunnan Province Grid	**YU**		

* grid category, covering more than one possible grid

Note 1. In this case, not all zones use the same projection.

Note 2. For US State plane coordinate systems with more than one zone, use of the 4-figure grid zone number given in FIPS 70-1 is recommended.

APPENDIX G

UNITS OF MEASURE CODES

G.1 SCOPE

TBD

G.2 APPLICABLE DOCUMENTS

The applicable documents in section 2 MIL-STD-2500B apply to this appendix.

G.3 DEFINITIONS

The definitions in section 3 MIL-STD-2500B apply to this appendix.

F.4 GENERAL REQUIREMENTS

DIGEST defines units of measurement as referenced by ISO 1000 "SI units and recommendations for the use of their multiples and of certain other units." However, there are certain units outside the SI (Système international), some of which are recognized by International Committee for Weights and Measures (CIPM), which need to be included in DIGEST because of their practical importance, i.e. occurrence in DGI datasets. These units have their codes enclosed by parentheses ( ).

When a compound unit is formed by multiplication of two or more units, it can be indicated in one of the following ways:

N · m or N m

DIGEST preference is "N · m" to avoid misinterpretation of the blank space.

When a compound unit is formed by dividing one unit by another, it can be indicated in one of the following ways:

m or m/s or m s-1

s

The DIGEST preference is "m/s".

Table G-1 lists the SI, and commonly recognized (shown in parentheses), units of measure which are most likely to occur within a DIGEST dataset, and their codes (abbreviations) for the various Units of Measure fields of the Data Set Parameter Group.

TABLE G-1. DIGEST Unit of Measure Codes.

	UNITS	CODE
	LENGTH	
1.	Micrometres	UM
2.	Millimetres	MM
3.	Centimetres	CM
4.	Decimetres	DM
5.	Metres	M
6.	Kilometres	KM
7.	Inches	(IN)

TABLE G-1. DIGEST Unit of Measure Codes - Continued.

	UNITS	CODE
8.	Feet	(FT)
9.	Yards	(YD)
10.	Fathoms	(FM)
11.	Fathoms and Feet	(FF)
12.	Statute Miles	(MI)
13.	Nautical miles	(NM)
	TIME	
14.	Seconds	S
15.	Minutes	MIN
16.	Hours	H
17.	Days	D
	SPEED	
18.	Metres per Second	M/S
19.	Kilometres per Hour	KM/H
20.	Miles per Hour	(MPH)
21.	Knots	(KNOT)
	AREA	
22.	Square metres	(M2)
23.	Square kilometres	(KM2)
24.	Hectares	(HA)
	ANGULAR MEASUREMENT	
25.	Mils	ML
26.	Seconds (of arc)	(SEC)
27.	Minutes (of arc)	(MA)
28.	Degrees (of arc)	(DEG)
	WEIGHT (MASS)	
29.	Kilograms	KG
30.	Kips	(KIP)
	PRESSURE	
31.	Millibars	MBAR
32.	Hectopascals	HPA
	ELECTRICITY	
33.	Volts	V
34.	Kilovolts	KV
35.	Watts	W
36.	Megawatts	MW
37.	Gigawatts	GW
38.	Amperes	A
39.	Hertz	HZ
40.	Kilohertz	KHZ
41.	Megahertz	MHZ
	MISCELLANEOUS	
42.	Beds	(BED)
43.	Features	(FEATURE)
44.	Lanes/Tracks	(LANE/TRACK)
45.	Levels	(LEVEL)
46	Lines	(LINE)
47.	Occults	(OCCULT)

TABLE G-1. DIGEST Unit of Measure Codes - Continued.

	UNITS	CODE
48.	Percent	(%)
49.	Persons	(PERSON)
50.	Qualifiers	(QUALIFIER)
51.	Structures	(STRUCTURE)
52.	Vehicles	(VEHICLE)

Note: Codes enclosed in parentheses indicate non-ISO 1000 units. The parentheses themselves do not form part of the code.